



AQUIFER EXEMPTION

Cat Canyon Oil Field, Sisquoc and Monterey Formation

A presentation by the Division of Oil, Gas and Geothermal Resources

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1. Location

2. Stratigraphy

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4. Exemption Proposal

5. Meets Federal Exemption Criteria

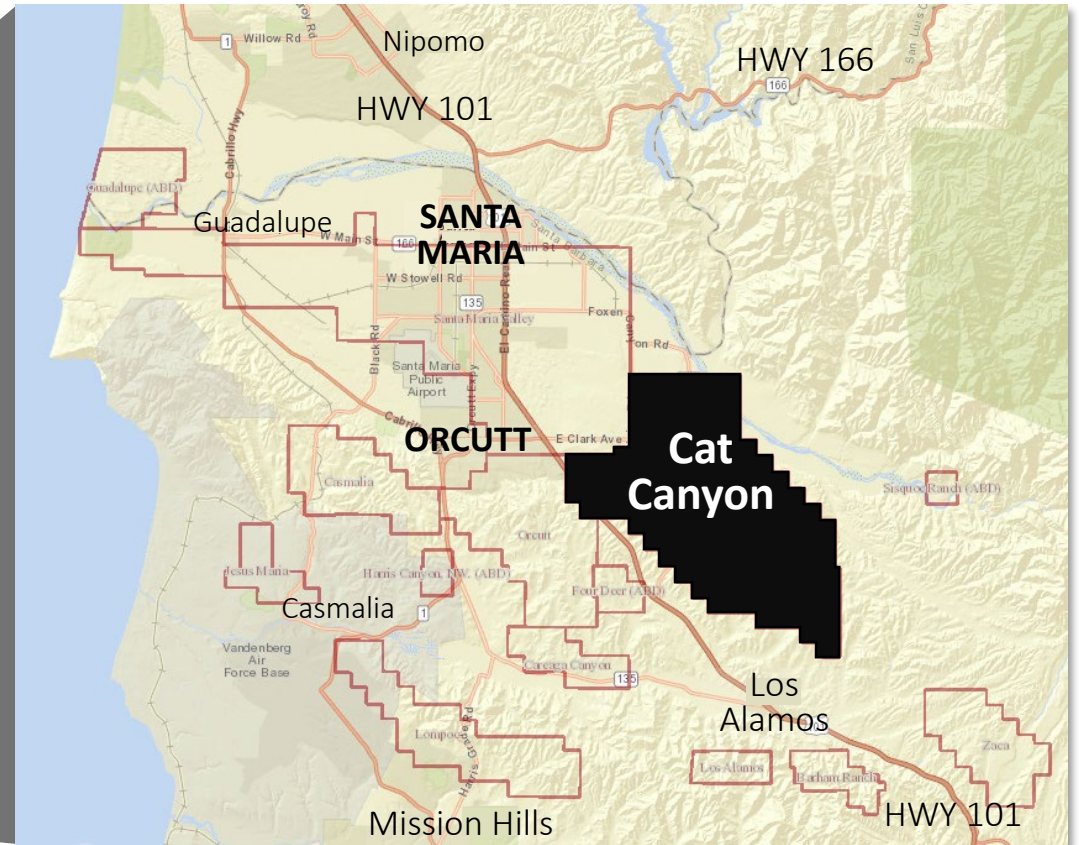
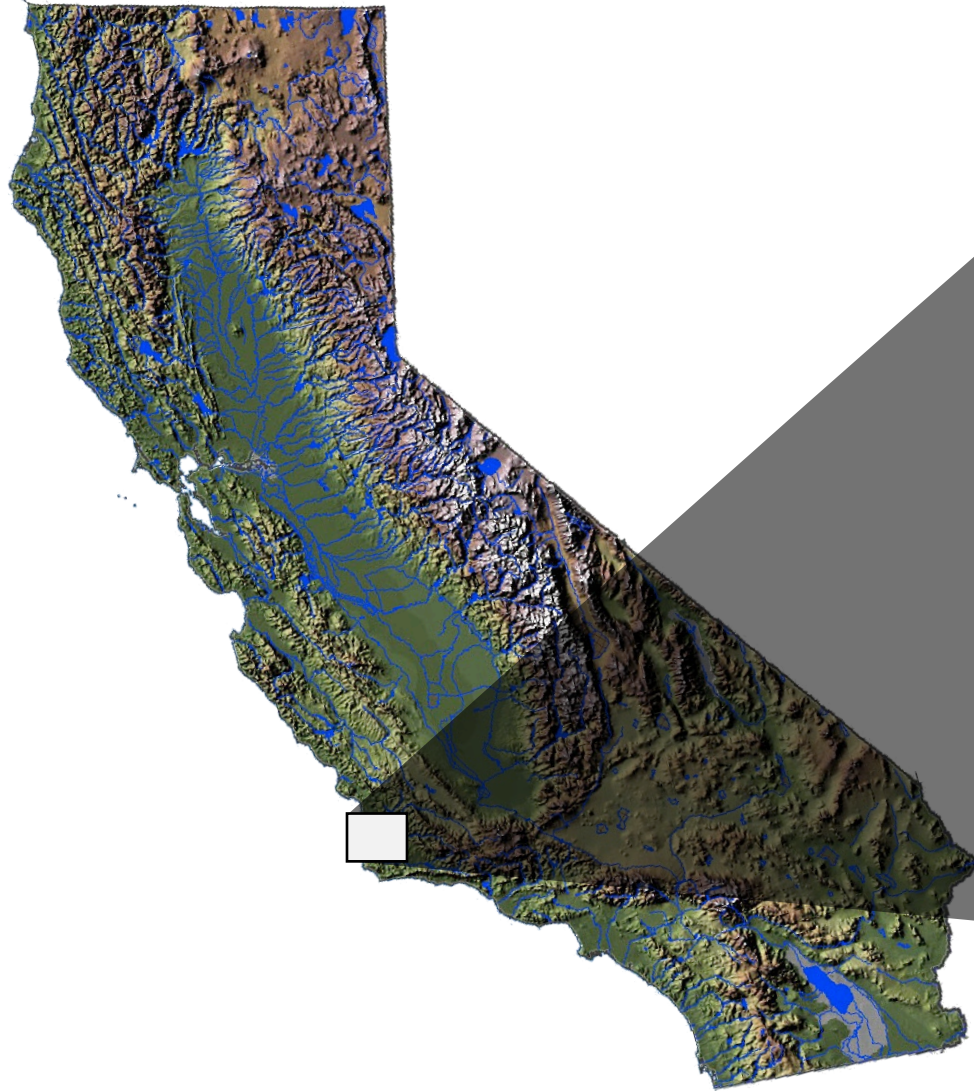
- Not a current source of drinking water
- Proposed aquifers contain oil
- Alternate sources of fresh water available

5. Meets State Exemption Criteria

- Injection will not affect the quality of water that may be used for any beneficial use.
- Injected fluid will remain in the portion of the aquifer to be exempted.

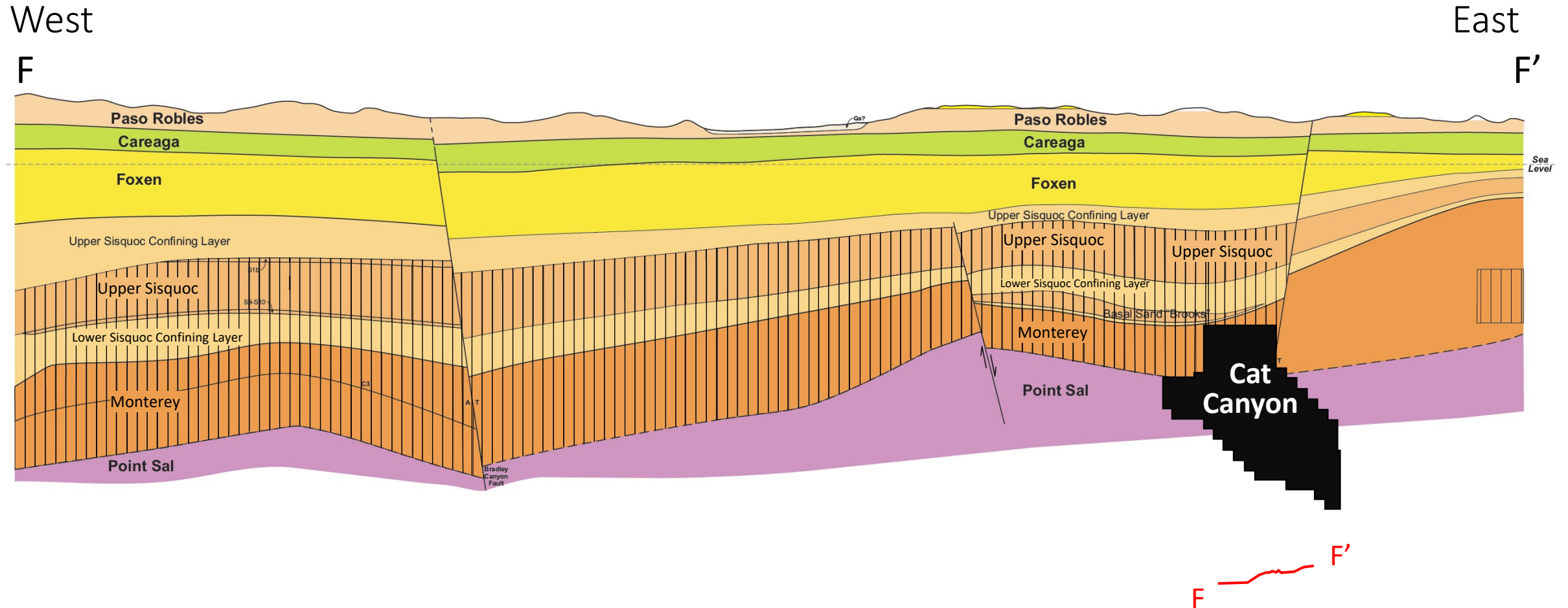


LOCATION



~ 4 Miles E-SE of Central Orcutt 4 Mi

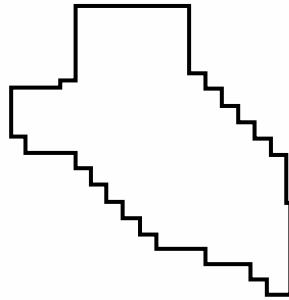
STRATIGRAPHY



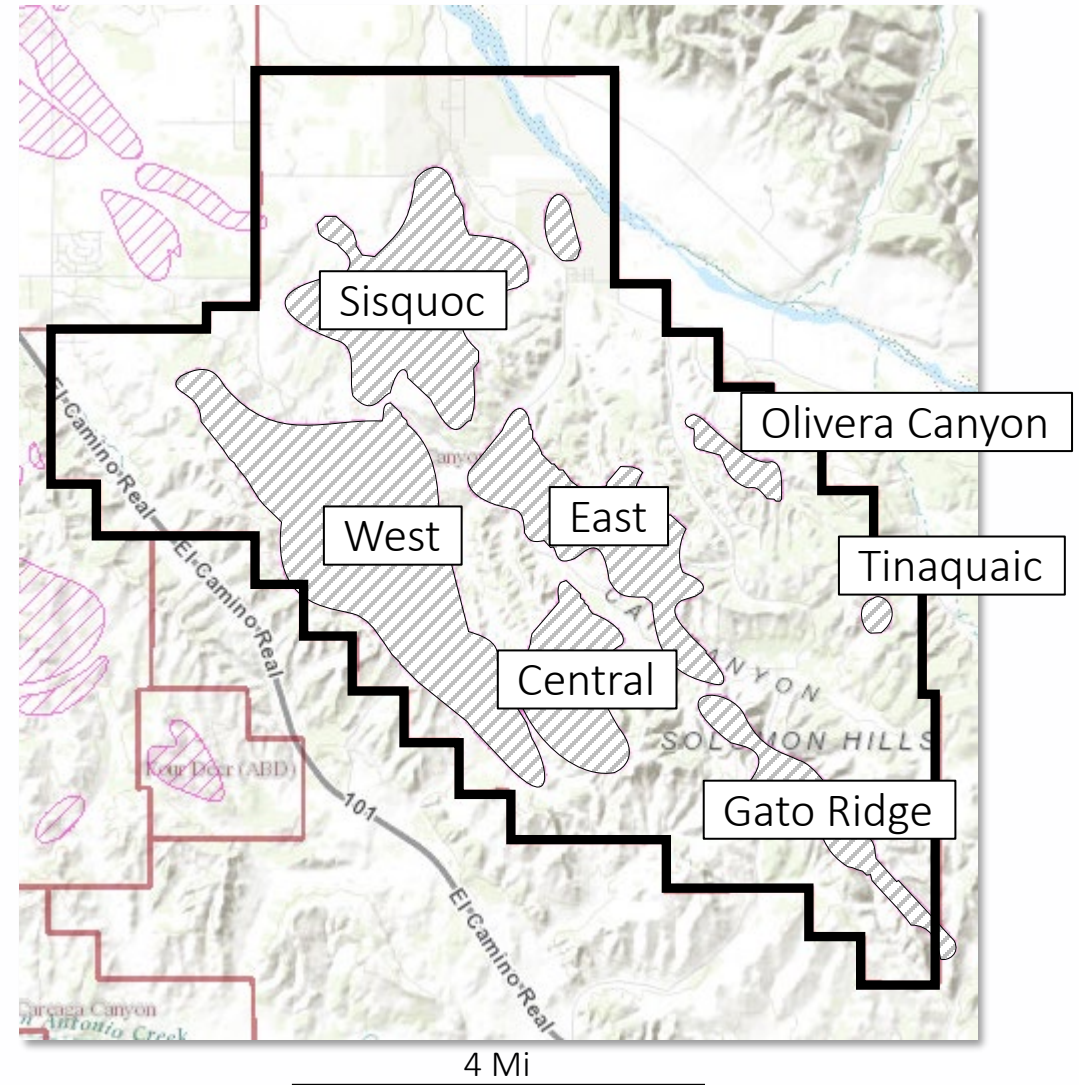
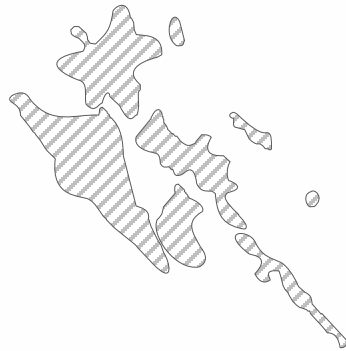
HISTORY

Primacy Exemption

Oil Field Boundaries



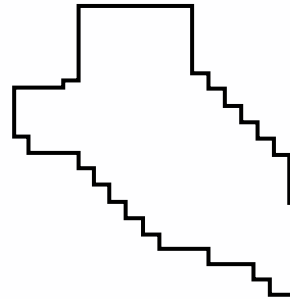
1973 Oil Productive Areas



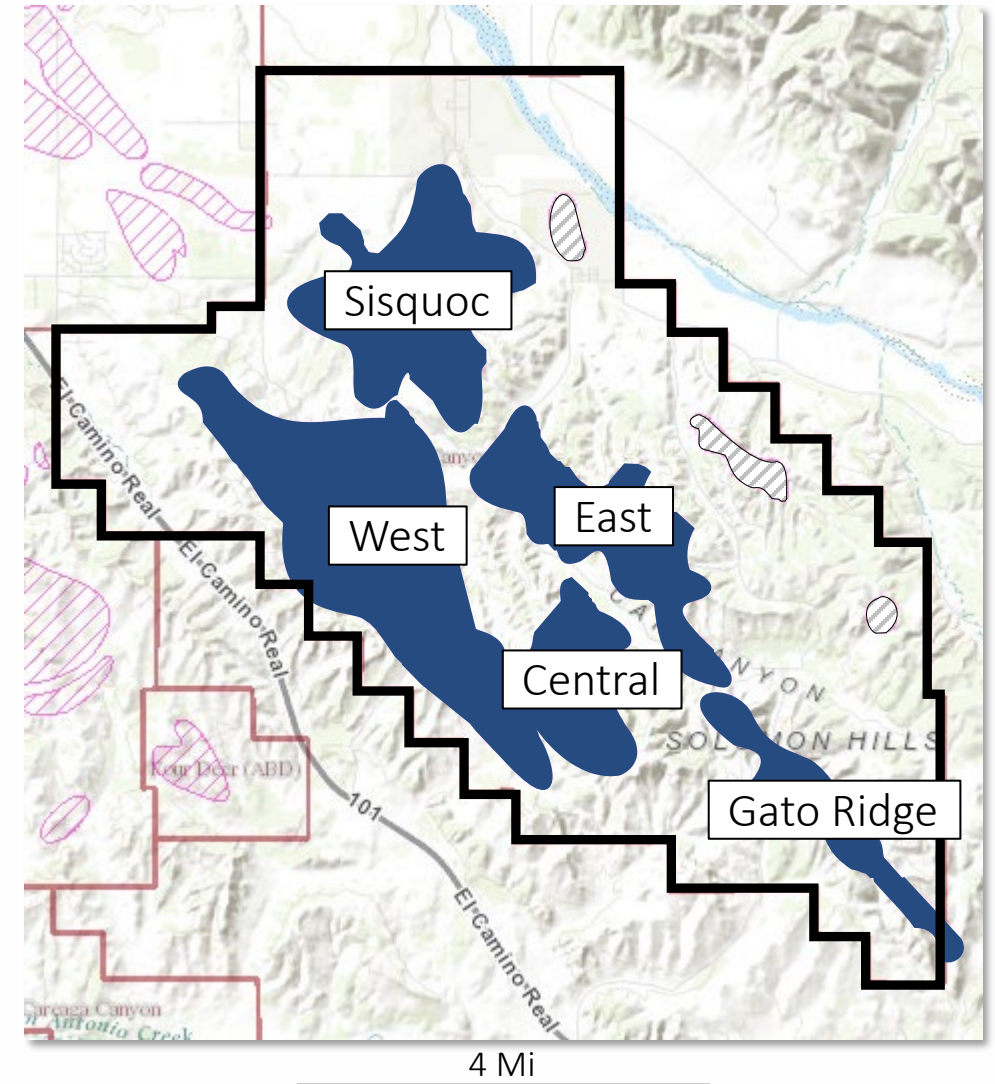
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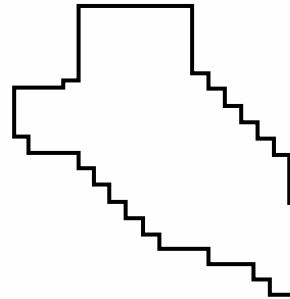
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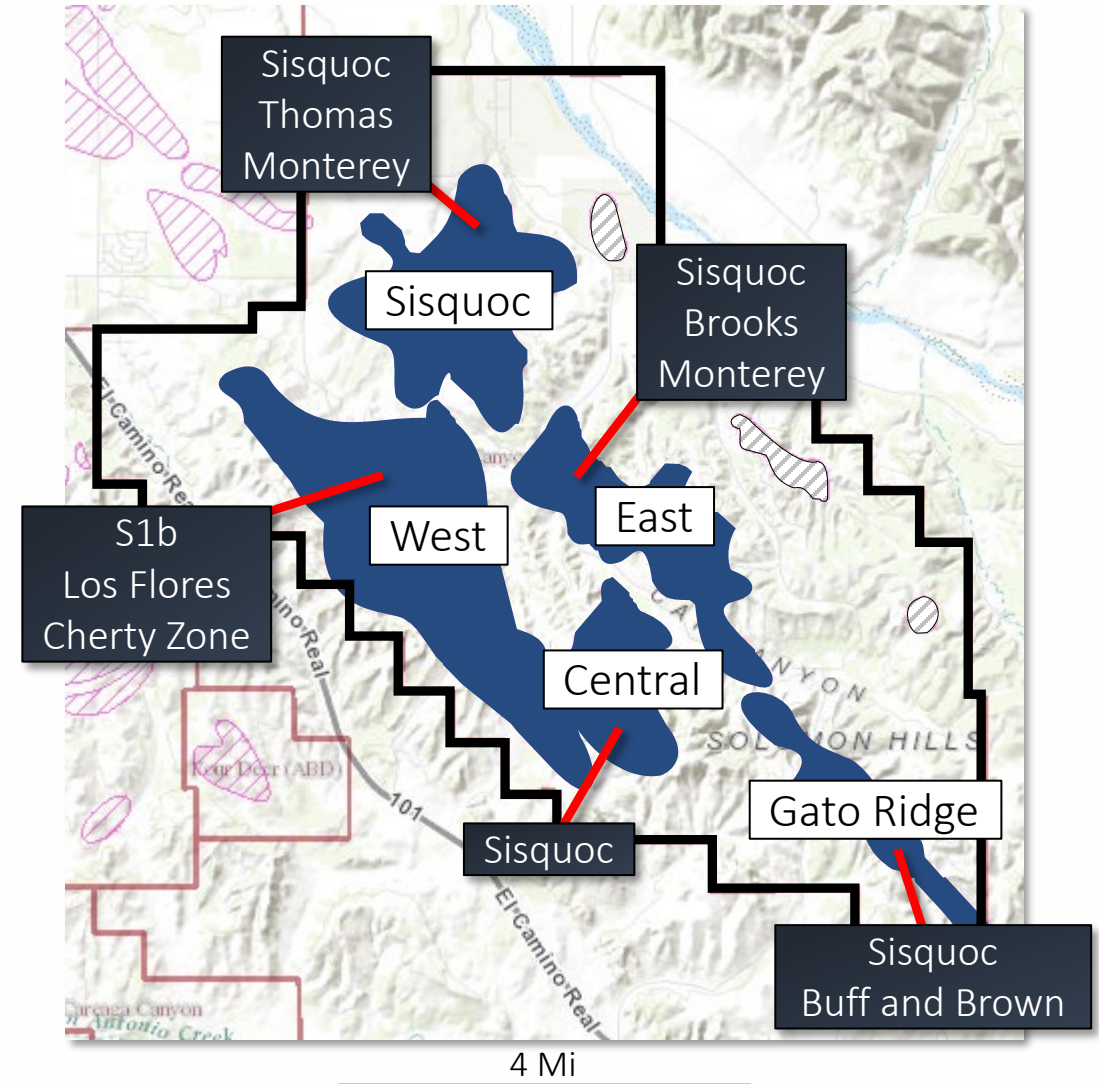
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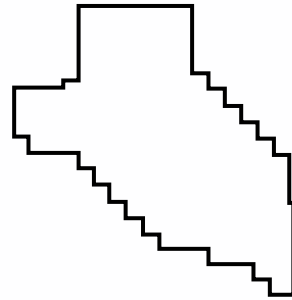


1973 Oil Productive Areas



EXEMPTION PROPOSAL

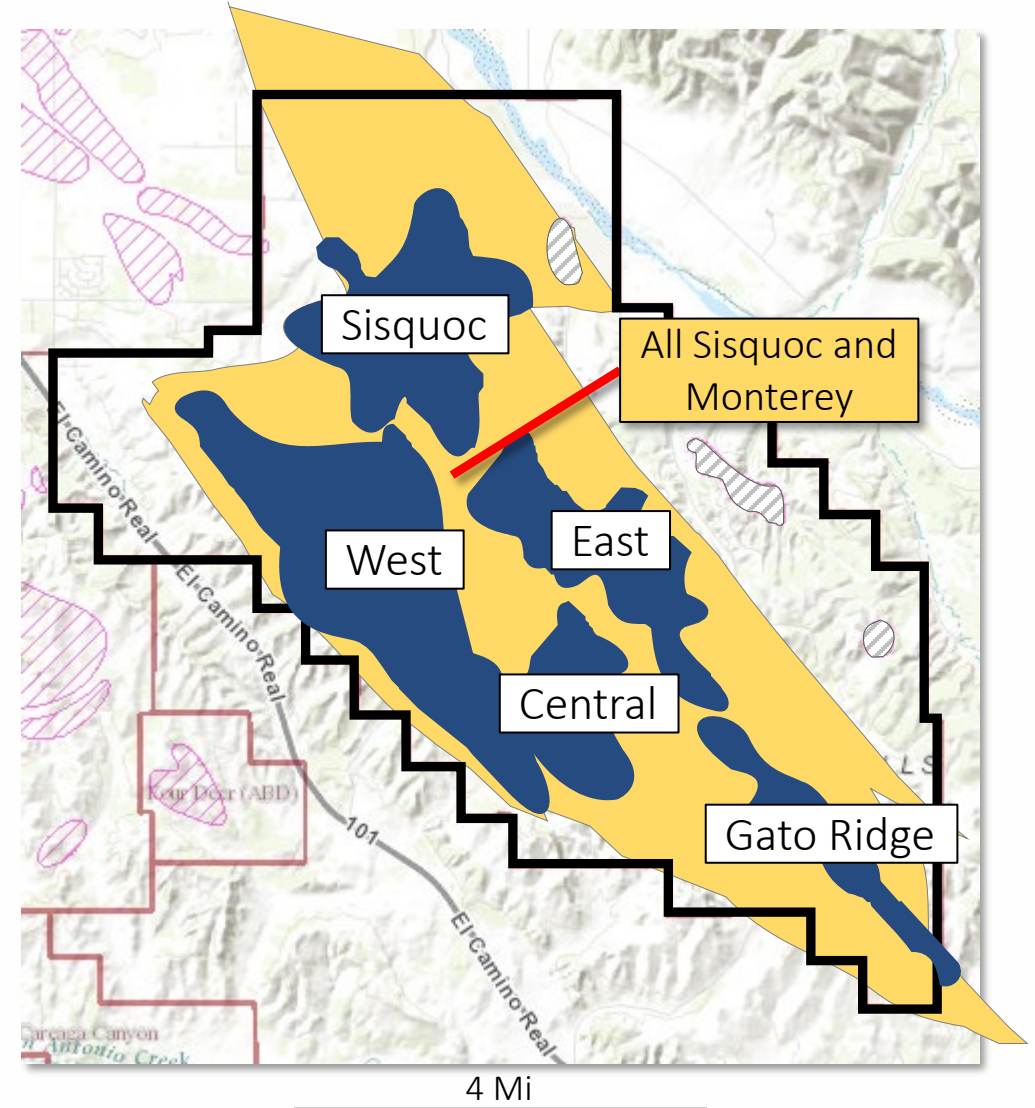
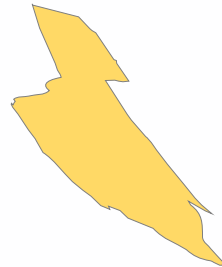
Oil Field Boundaries



1973 Oil Productive Areas



Proposed Exemption Area
(Sisquoc known oil)



- a) **The aquifer does not currently serve as a source of drinking water.**
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- The nearest public supply well is close to the edge of the expansion area (less than ¼ mile), and appears to serve an elementary school.

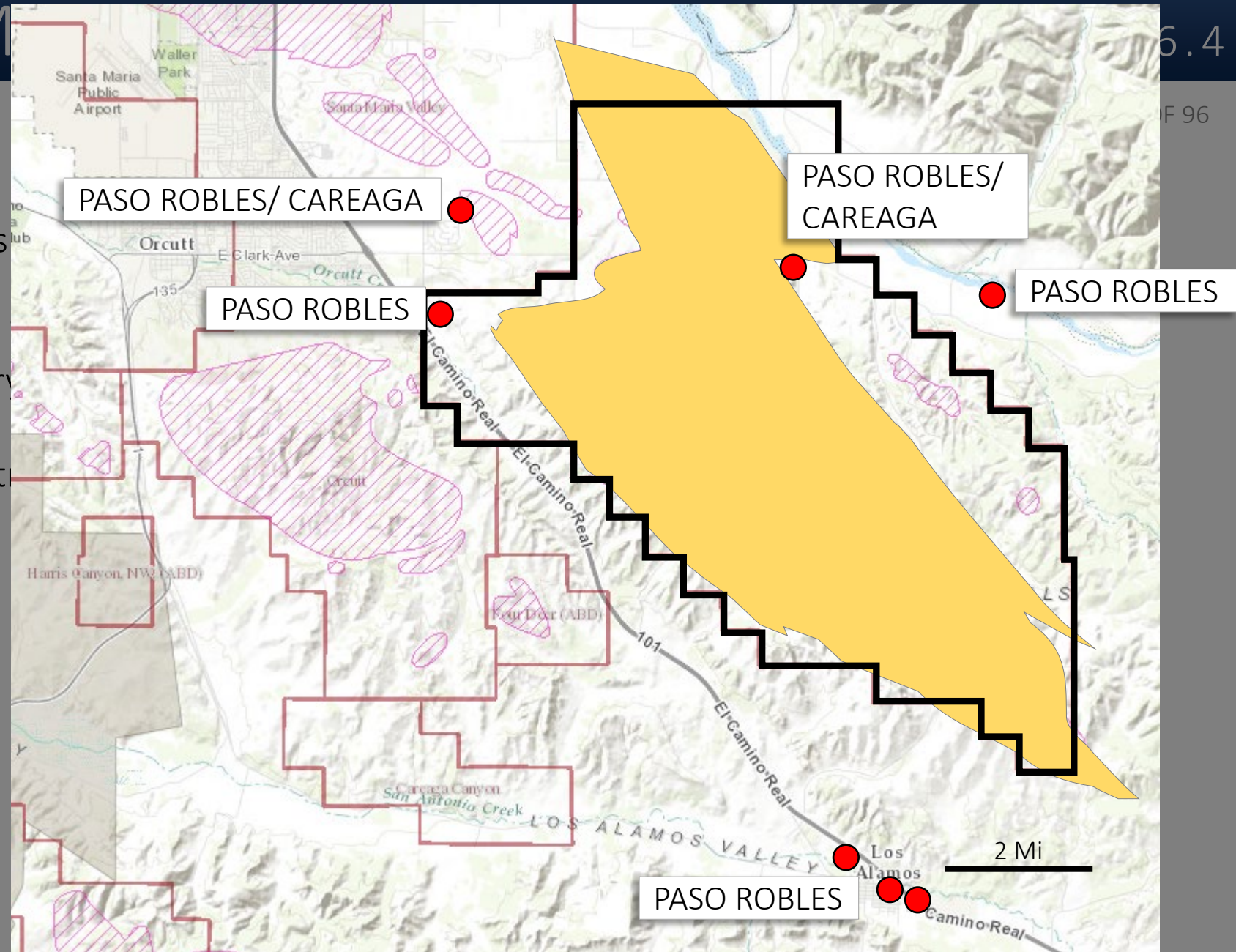
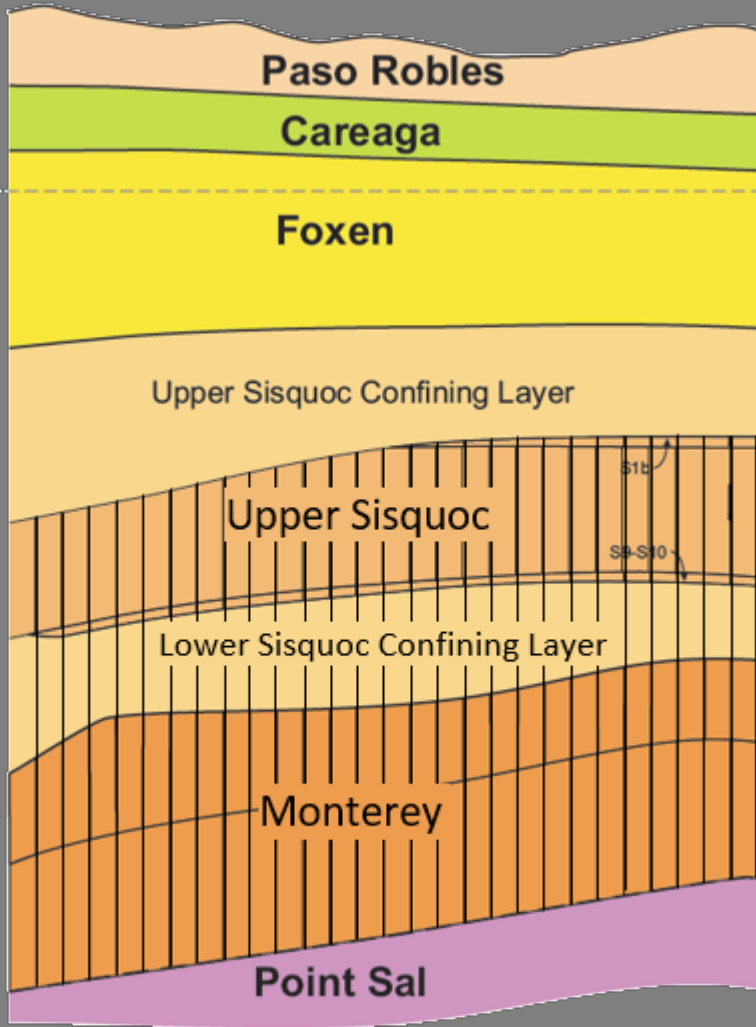


PUBLIC WATER WELLS

- There are 7 public supply wells in the study area, but **none** are in the expansion area.
- The nearest public supply well is close to the edge of the expansion area (less than ¼ mile), and appears to supply water to an elementary school.
- None of the public wells penetrate the Sisquoc or Monterey Formations.



FEDERAL EXEMPT



6.4

F 96



WATER WELLS

PDF 96

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- In the study area, 98% of the water wells are completed above the Sisquoc formation. 7 water wells penetrate the Sisquoc and/or Monterey. They are either labelled Test Hole, Domestic Irrigation, or Irrigation. They do not appear to be used for drinking water.



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- In the proposed expansion area, only one water well penetrates the Sisquoc Formation, but its only as deep as the uppermost portion of the thick, overlying shale. This well does not penetrate the portion of Sisquoc proposed for exemption.



WATER WELLS

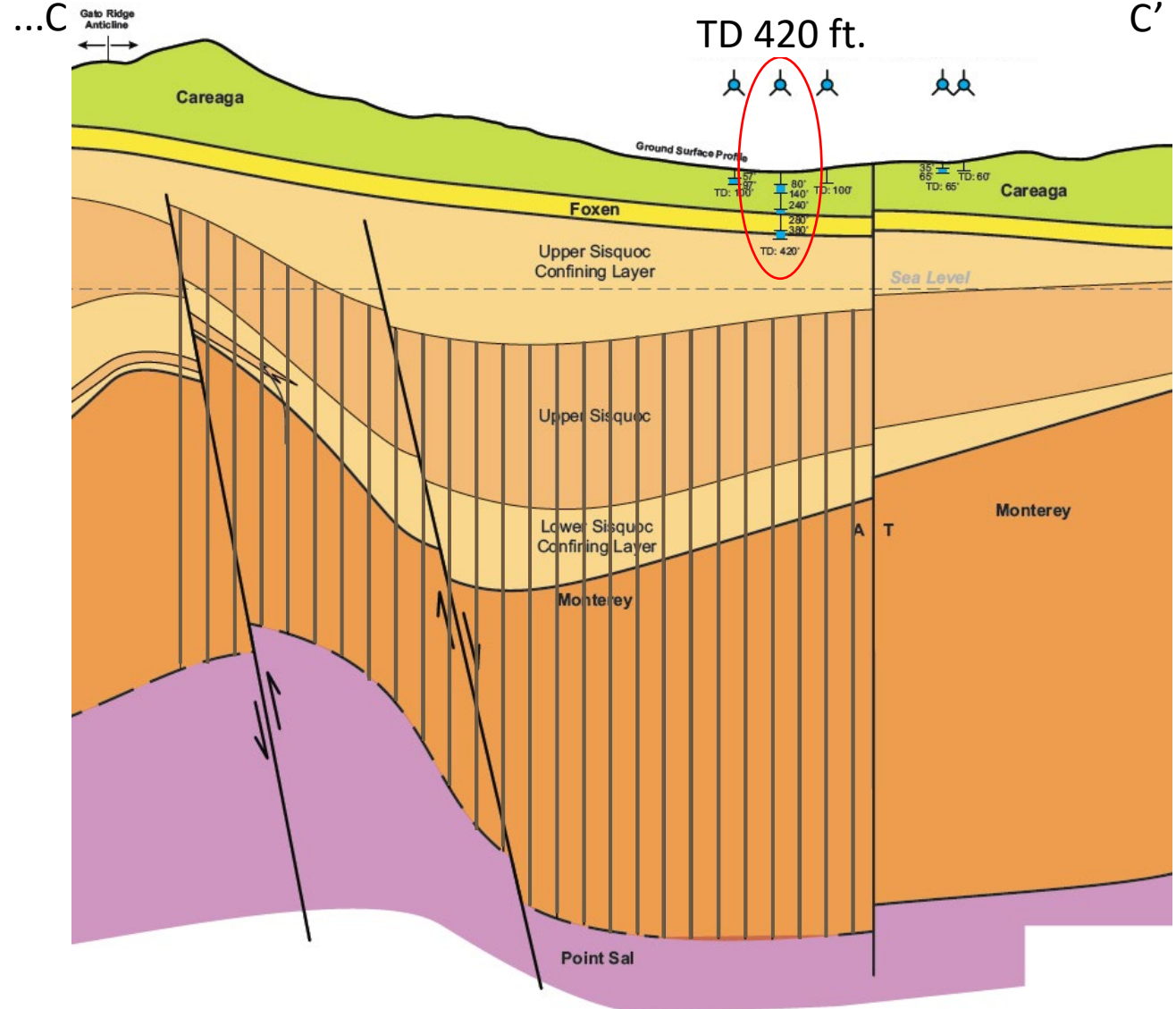
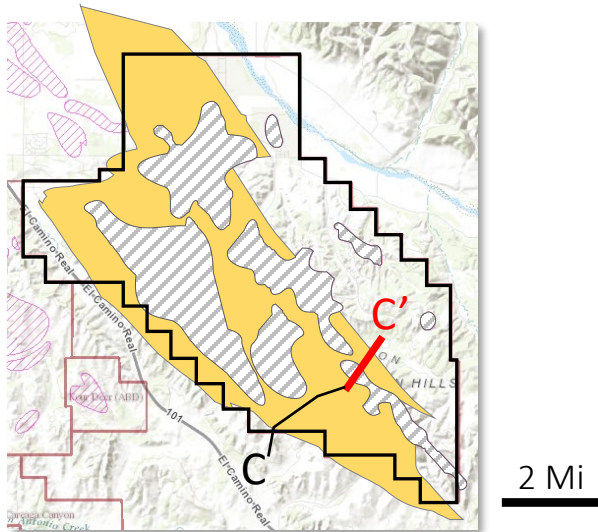
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- There are 2 domestic wells for which we have no depth information. One is inside the proposed expansion area. The other well is outside of the proposed area, and it is separated from the area by a sealing fault.



STRATIGRAPHICALLY DEEPEST WATER WELLS

- This is the stratigraphically deepest well in the proposed exempt area. It penetrates the Upper Sisquoc Confining layer. It's documented purpose is domestic/ irrigation.

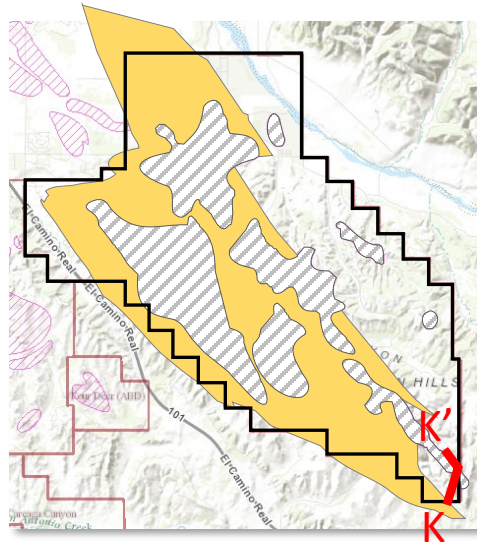


C'

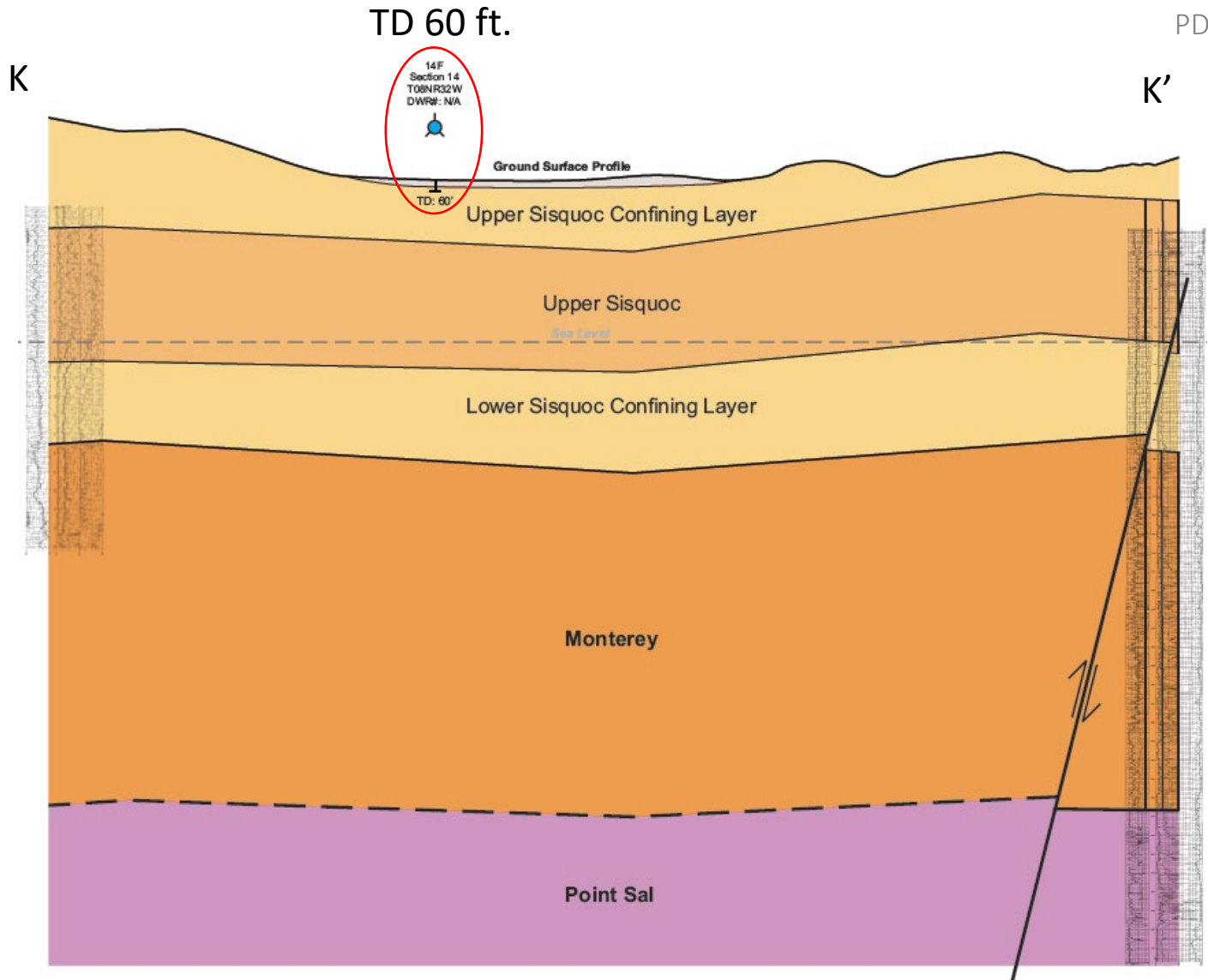


STRATIGRAPHICALLY DEEPEST WATER WELLS

- This well is slightly beyond the proposed expansion area and also penetrates the Upper Sisquoc Confining Layer. It's documented purpose is irrigation.



2 Mi



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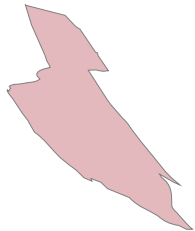
FEDERAL EXEMPTION CRITERIA

40 CFR 146.4

OIL IN THE MONTEREY FORMATION

- Monterey Formation is the area's petroleum source rock. Oil is found nearly everywhere where the Monterey is present.
- Production is most prolific in areas of high fracture density and permeability. This is generally along the crests of folds and/or near faults.

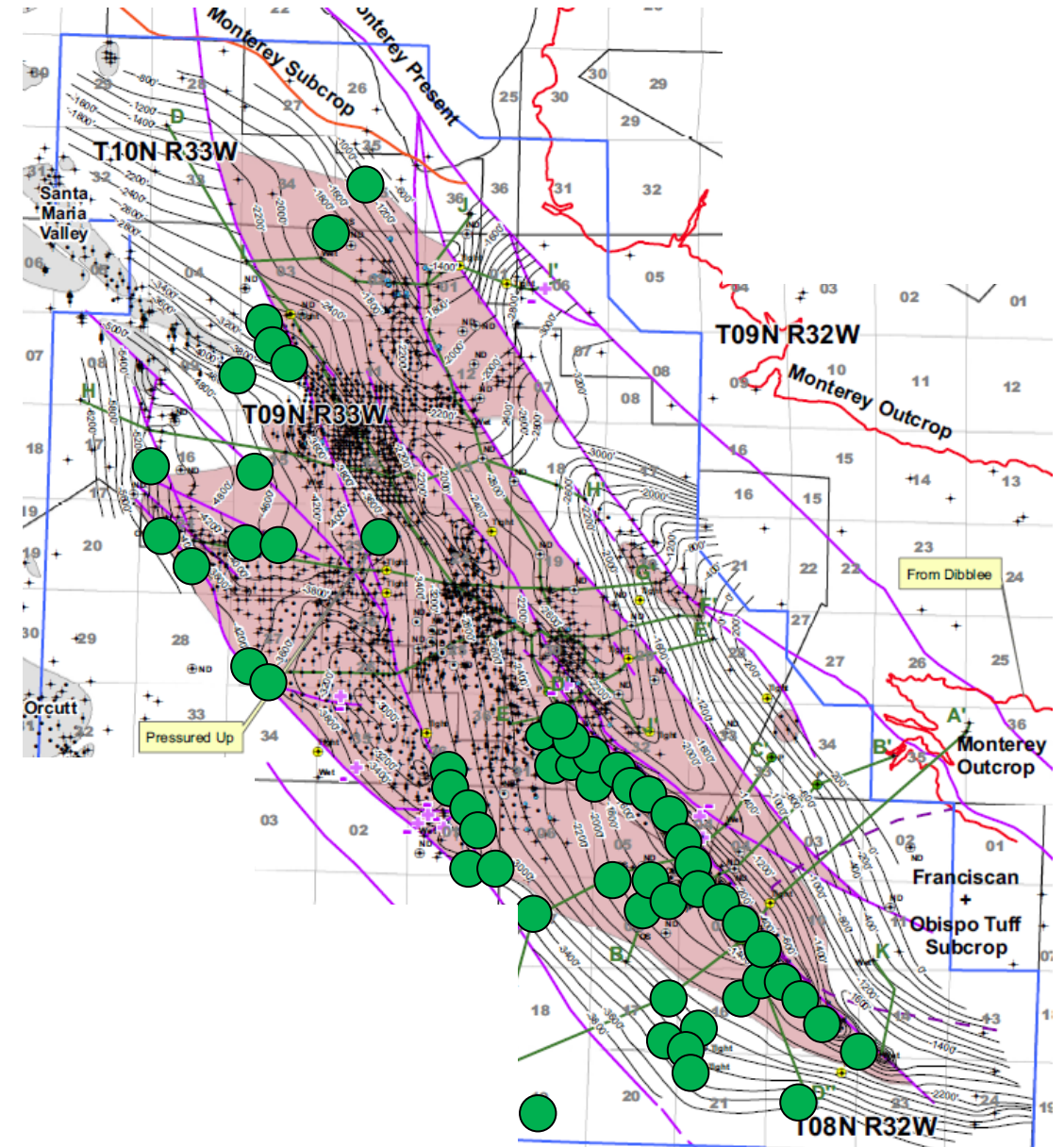
Proposed
Exemption Area



Oil Shows



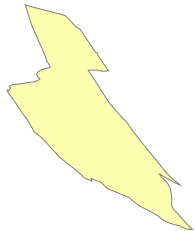
Active Oil
Production Areas



OIL IN THE SISQUOC FORMATION

- The Sisquoc Formation lays above the Monterey. The known extent of oil within the Sisquoc defines the proposed exemption area.
- Like the Monterey, production is most prolific in areas of high fracture density and permeability. This is generally along the crests of folds and/or near faults.

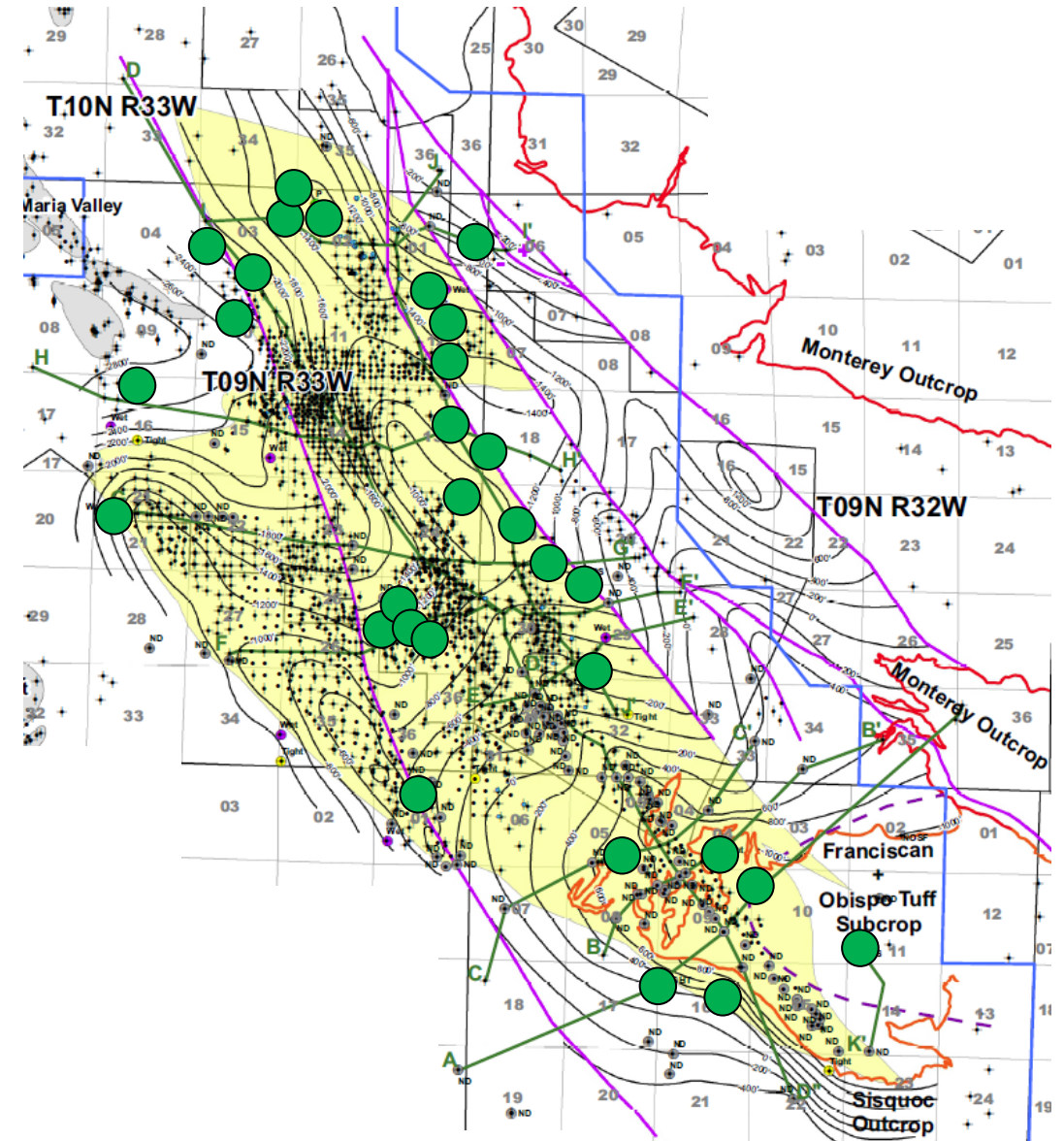
Proposed
Exemption Area



Oil Shows



Active Oil
Production Areas



PRC 3131 (a)

1. Criteria set forth in Section 146.4 of Title 40 of the Code of Federal Regulations.
2. The injection of fluids will not affect the quality of water that is, or may reasonably be, used for any beneficial use.
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PRC 3131 (a)



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Above these formations, are large, **FRESH AQUIFERS**
which adequately provides abundant water for the area.



PRC 3131 (a)





PRC 3131 (a)

STEAM WELLS IN CAT CANYON

2,800 - 35,000

13,730 - 26,444

2,870 - 11,800

21,000

6,100 - 17,780

4 Mi



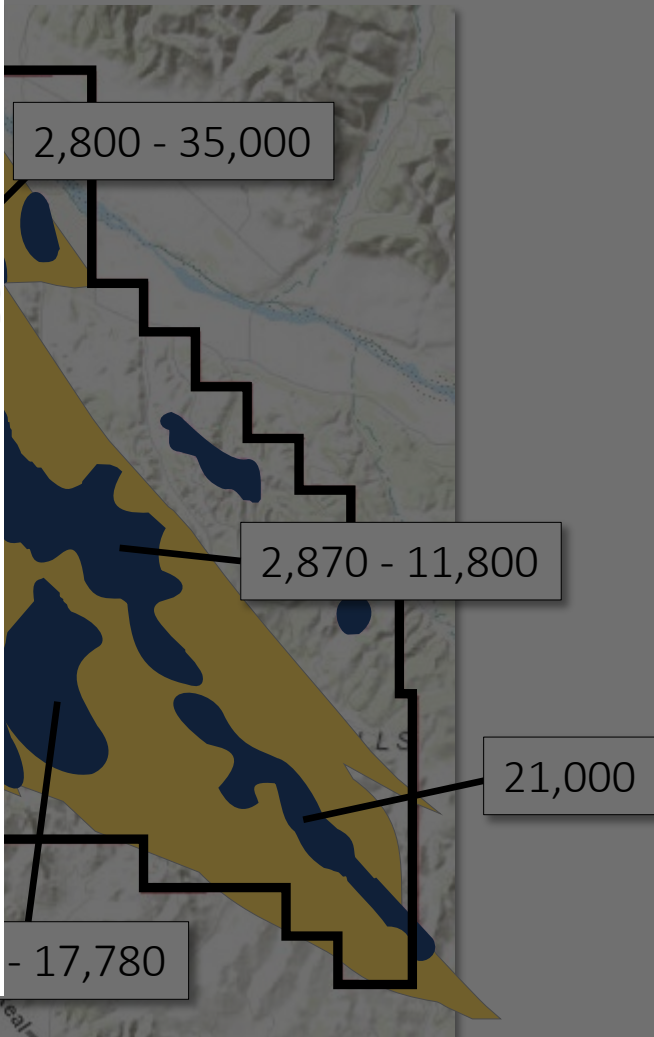
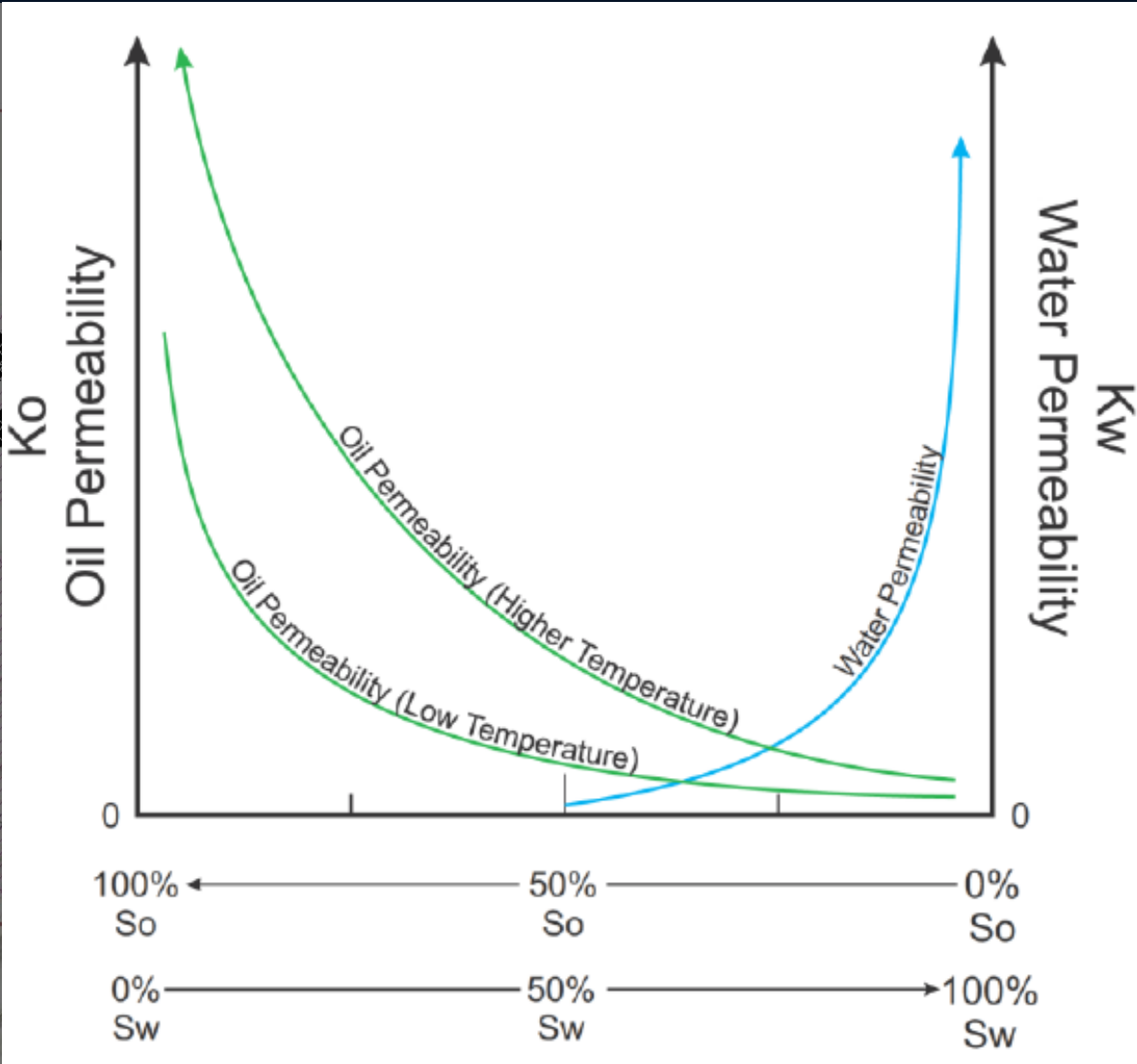
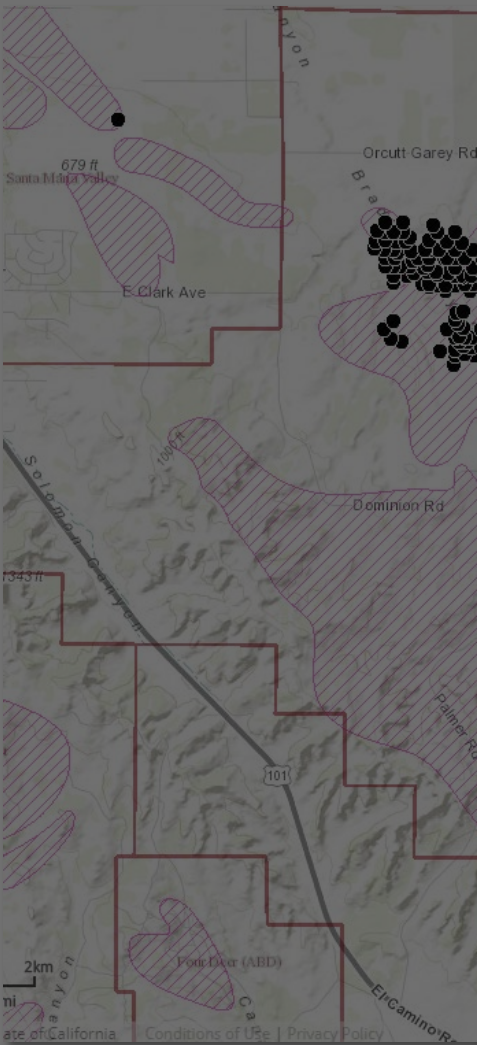
STATE EXEMPTION CRITERIA

PRC 3131 (a)

STEAM WELLS IN CAT CA

N TDS RANGE

PDF 116



INJECTATE WATER QUALITY

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- Prevent scale build up (Surfactants)
- Reduce particulates and insoluble compounds (Clarifiers)
- Manage asphaltene and paraffin precipitation (Aromatic Compounds)



PRC 3131 (a)

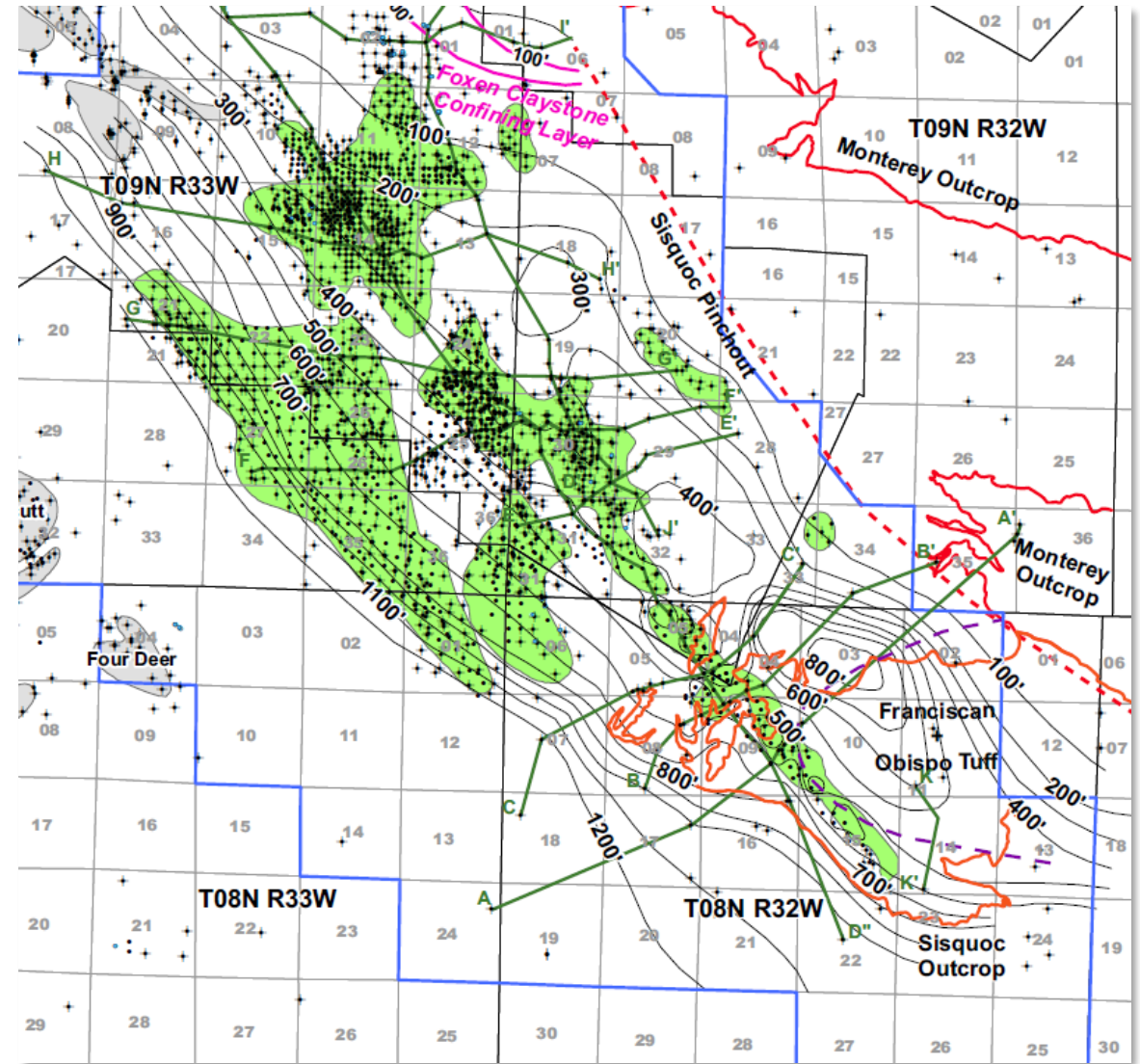
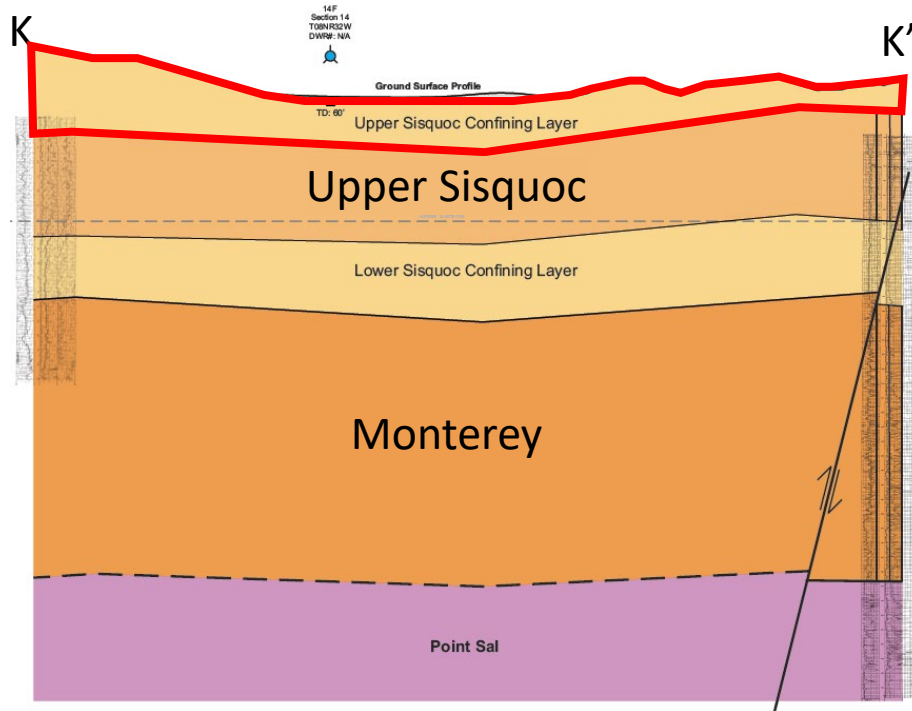
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STATE EXEMPTION CRITERIA

PRC 3131 (a)

UPPER SISQUOC CONFINING LAYER THICKNESS

0 to 1,100 ft thick. Where 0 ft thick in the NE, the Foxen Claystone provides confinement.

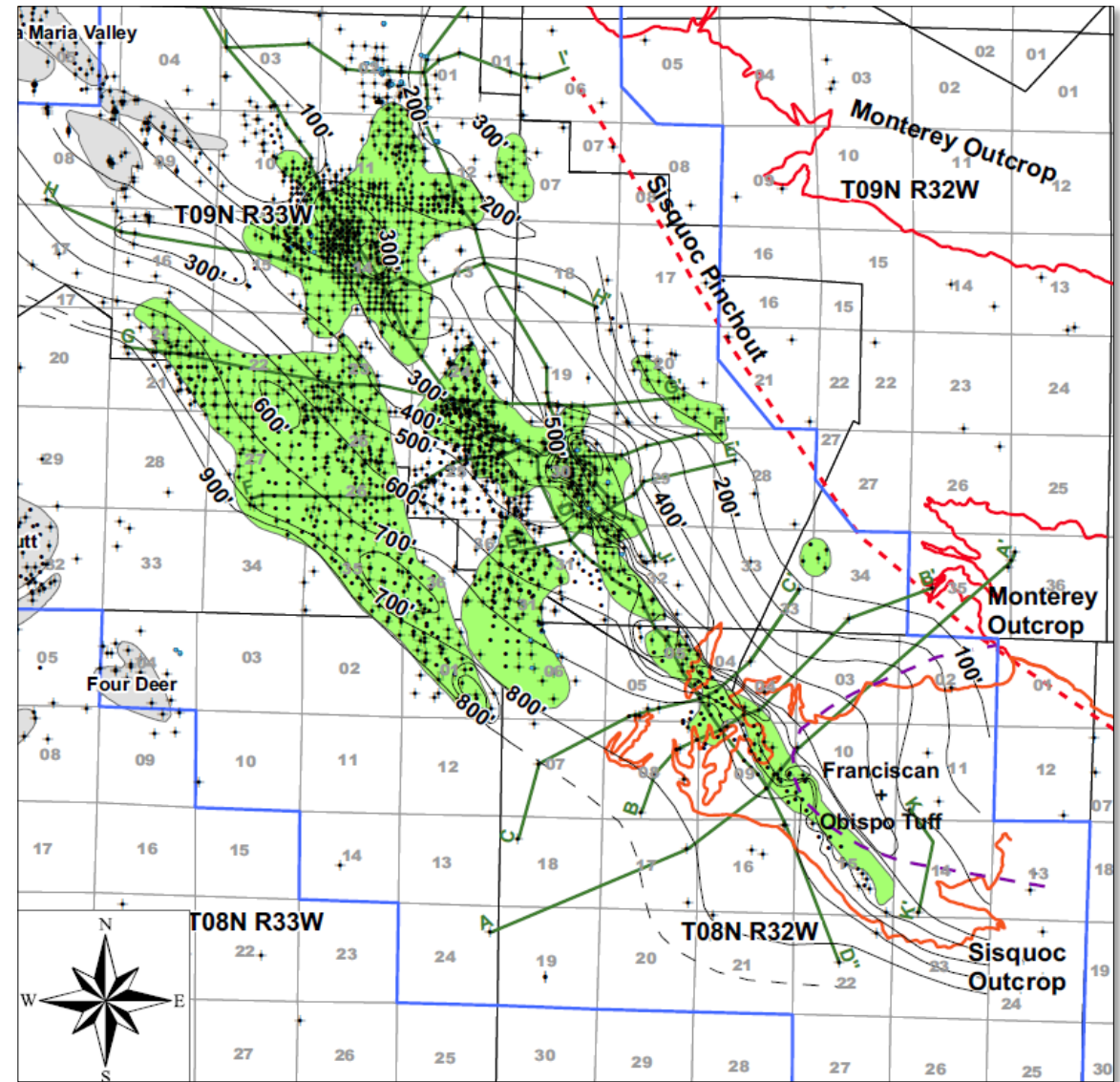
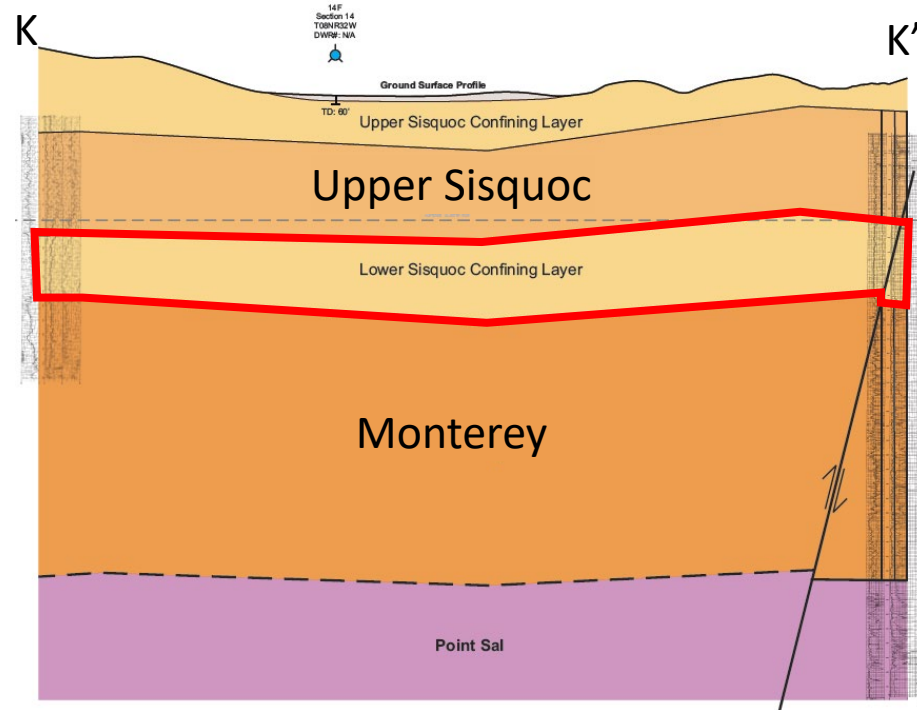


STATE EXEMPTION CRITERIA

PRC 3131 (a)

BASAL SISQUOC/ OVERLAYING MONTEREY
CONFINING LAYER THICKNESS

100 to 900 ft thick

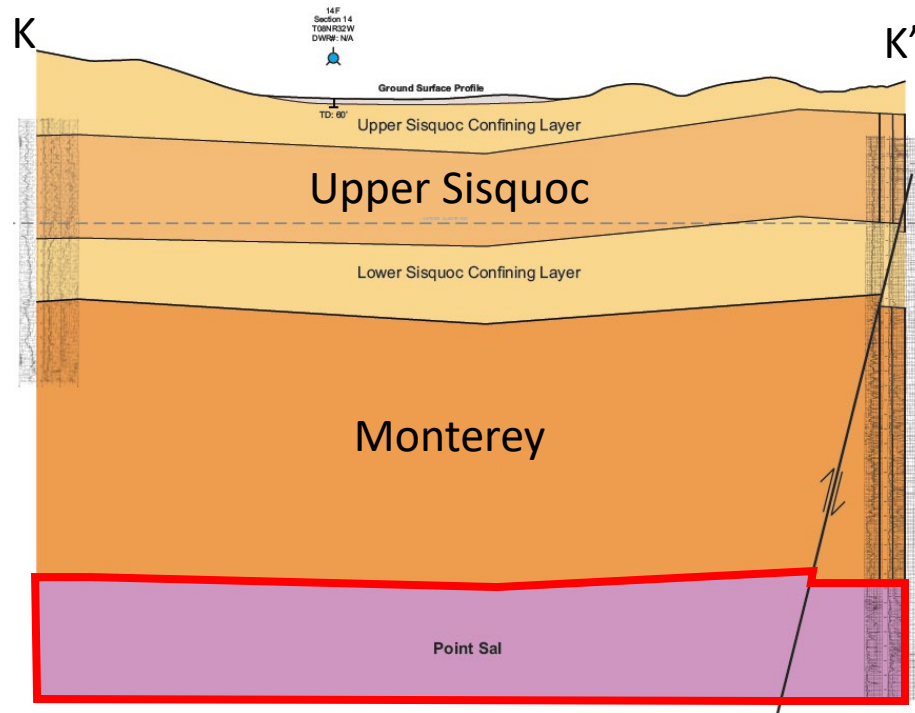


STATE EXEMPTION CRITERIA

PRC 3131 (a)

POINT SAL, UNDERLAYING MONTEREY CONFINING LAYER

Averages 750 ft thick

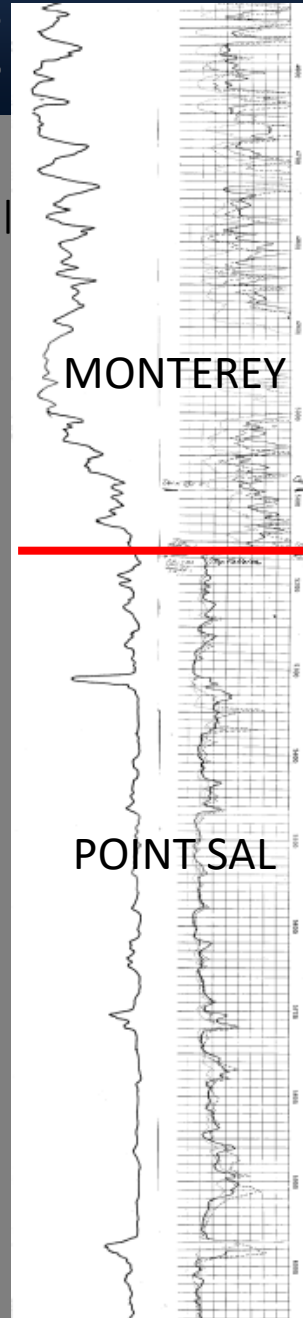
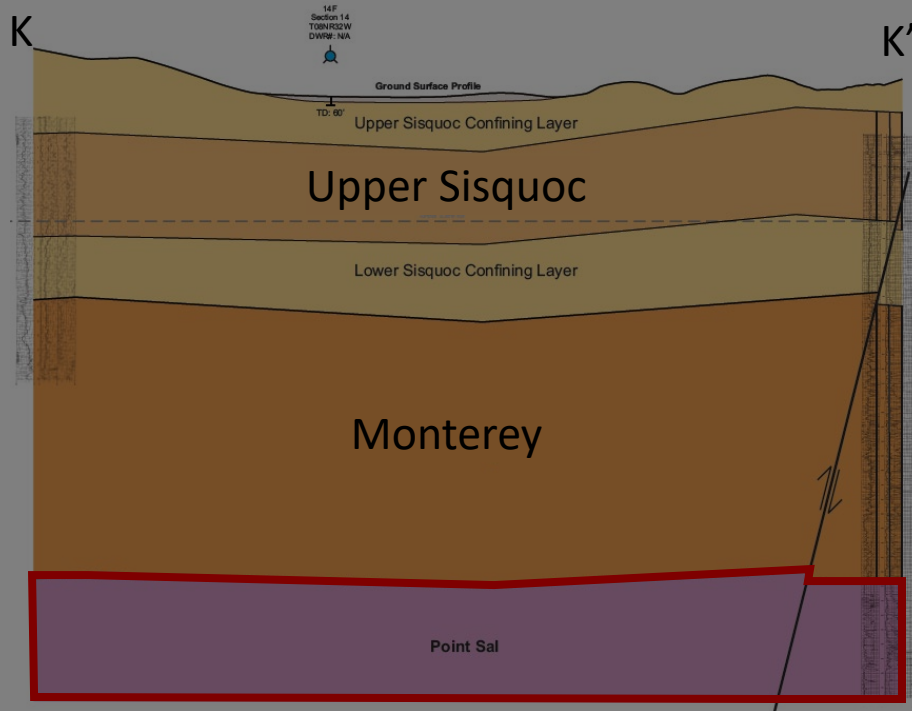


Estimated Permeability < 0.1 millidarcy (8.4×10^7 cm/s)
(Method by Freeze and Cherry, 1979)

STATE EXEMPTION C A

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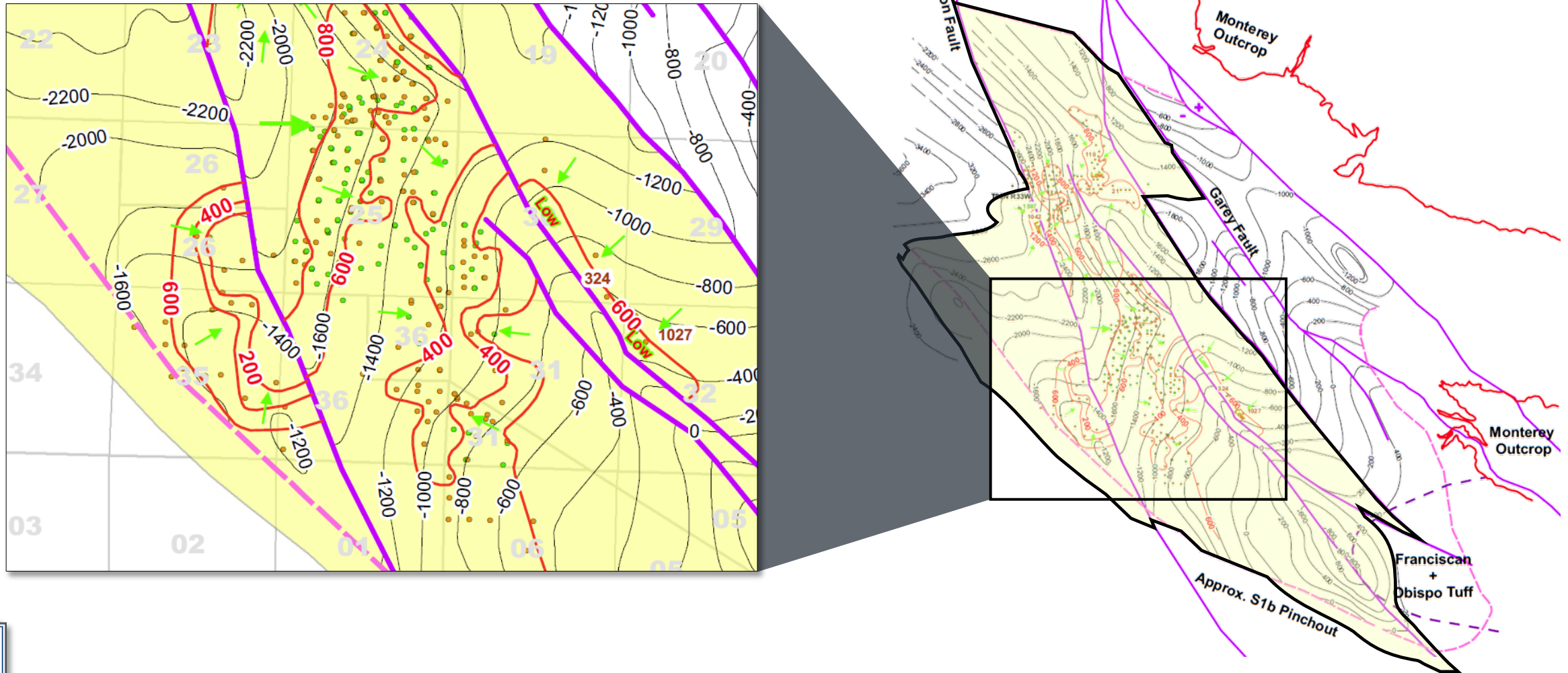


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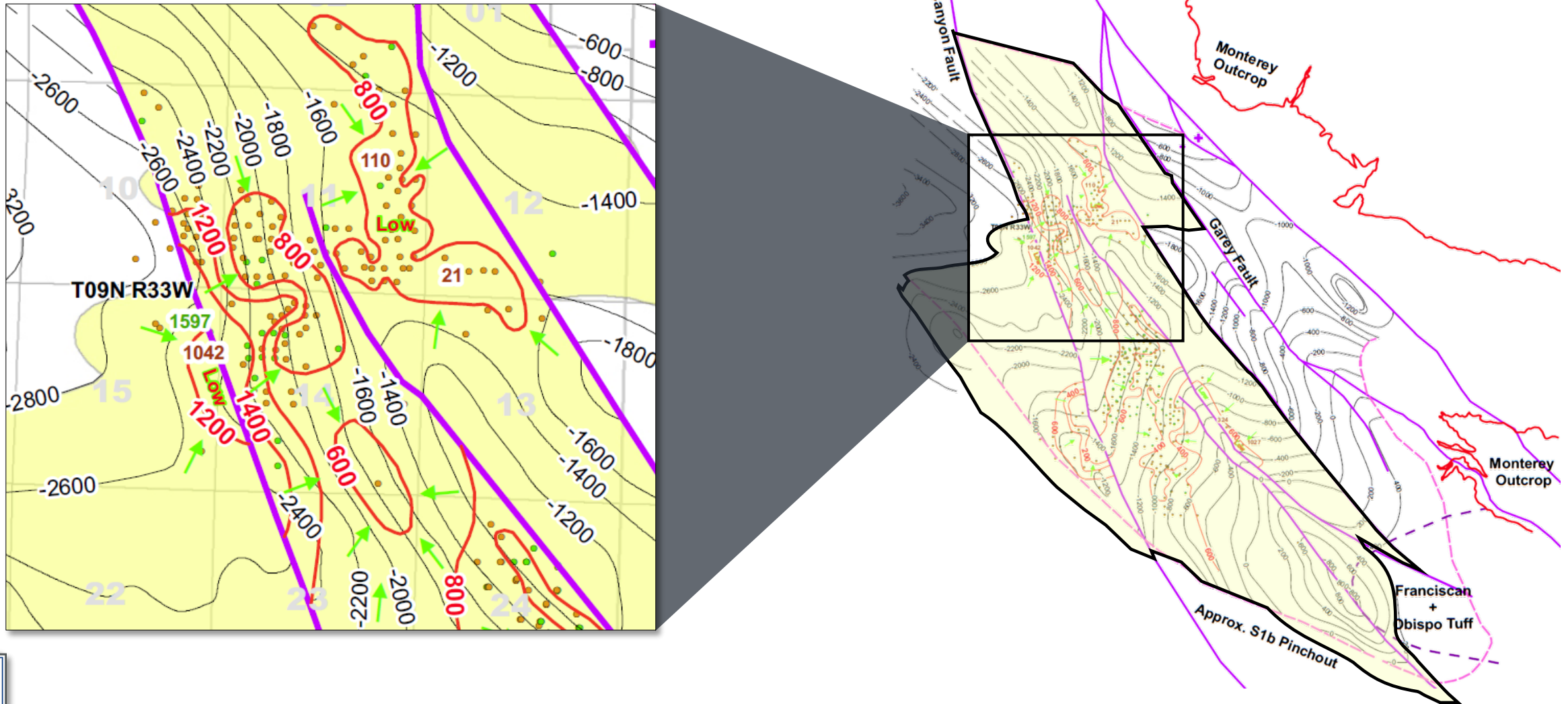
SISQUOC: INWARD PRESSURE GRADIENT



STATE EXEMPTION CRITERIA

PRC 3131 (a)

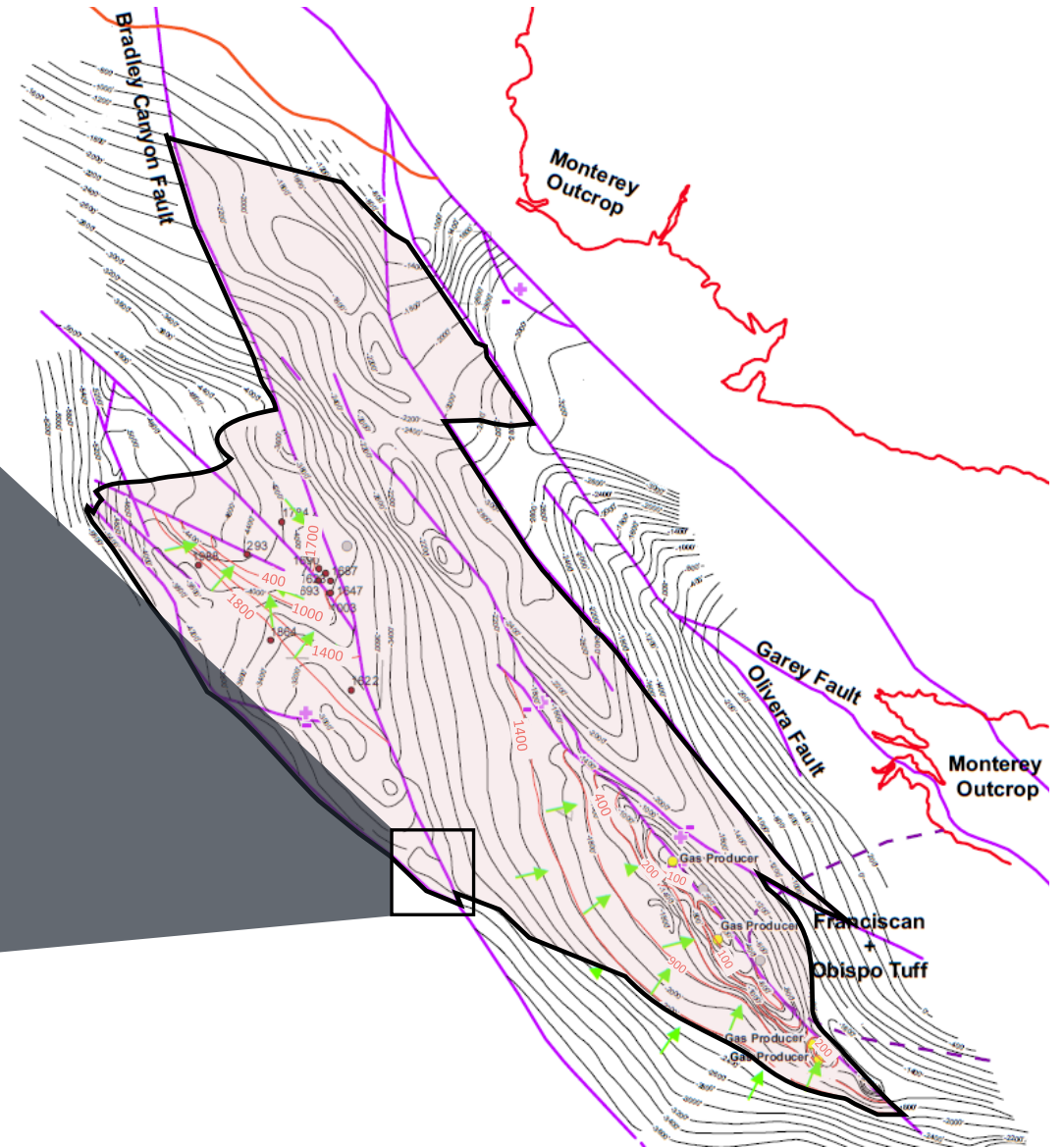
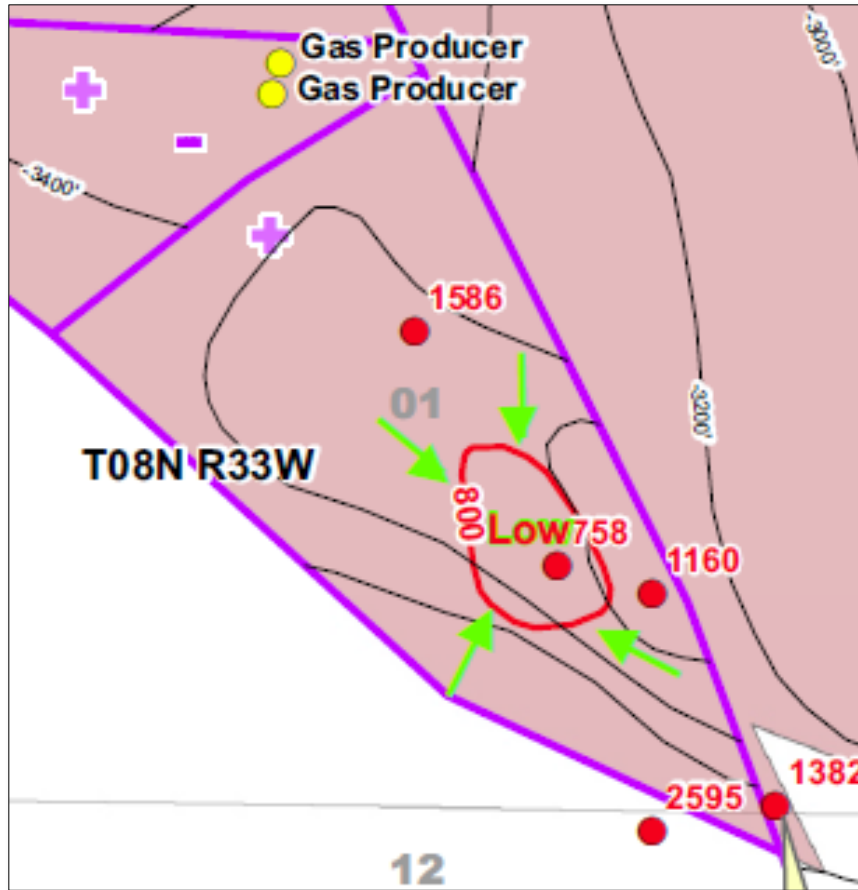
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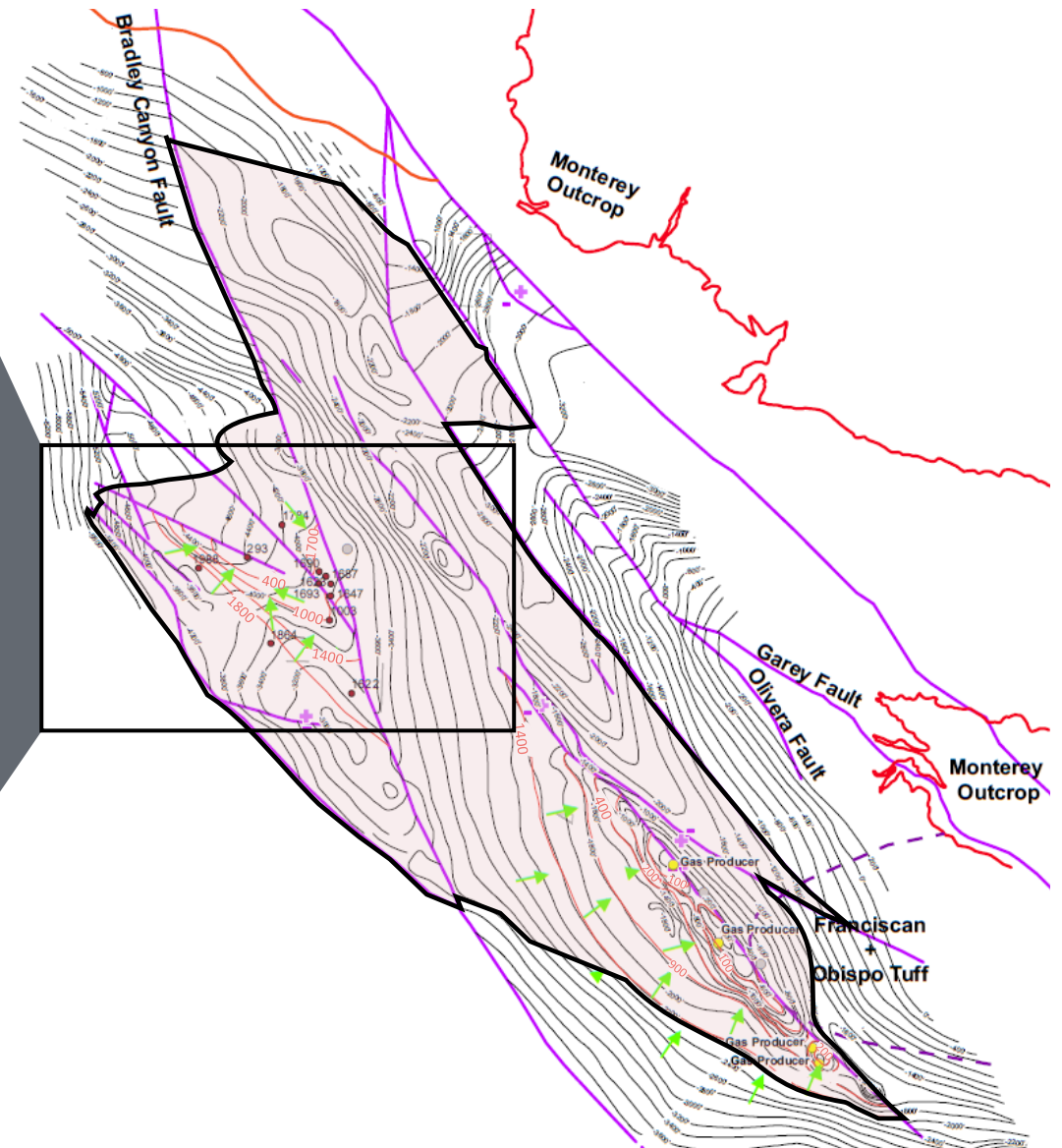
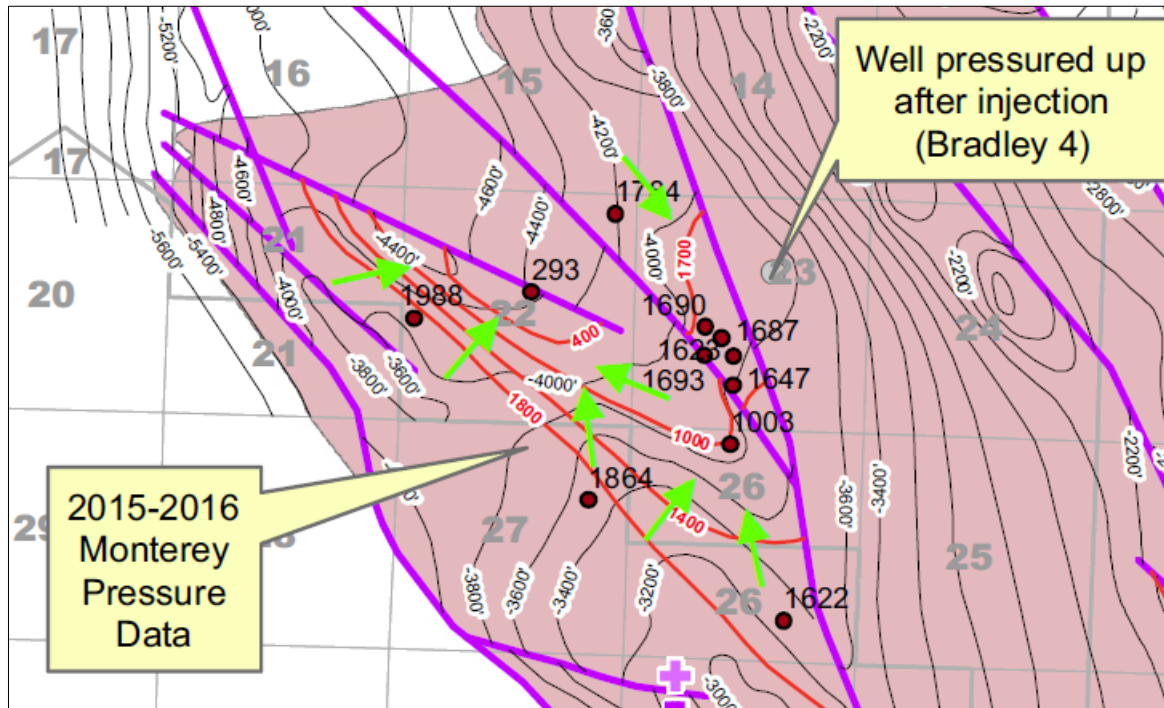
MONTEREY: INWARD PRESSURE GRADIENT



STATE EXEMPTION CRITERIA

PRC 3131 (a)

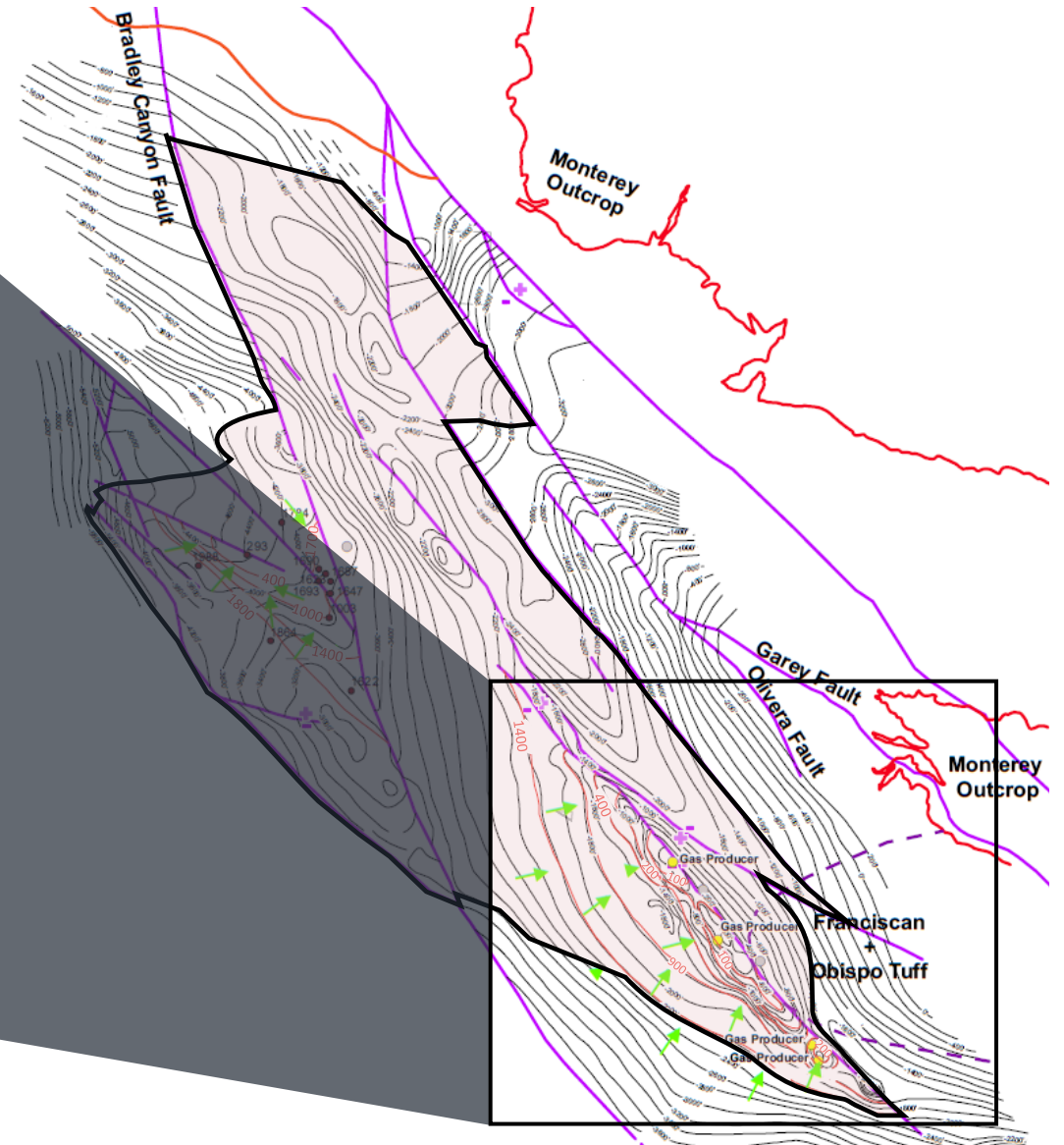
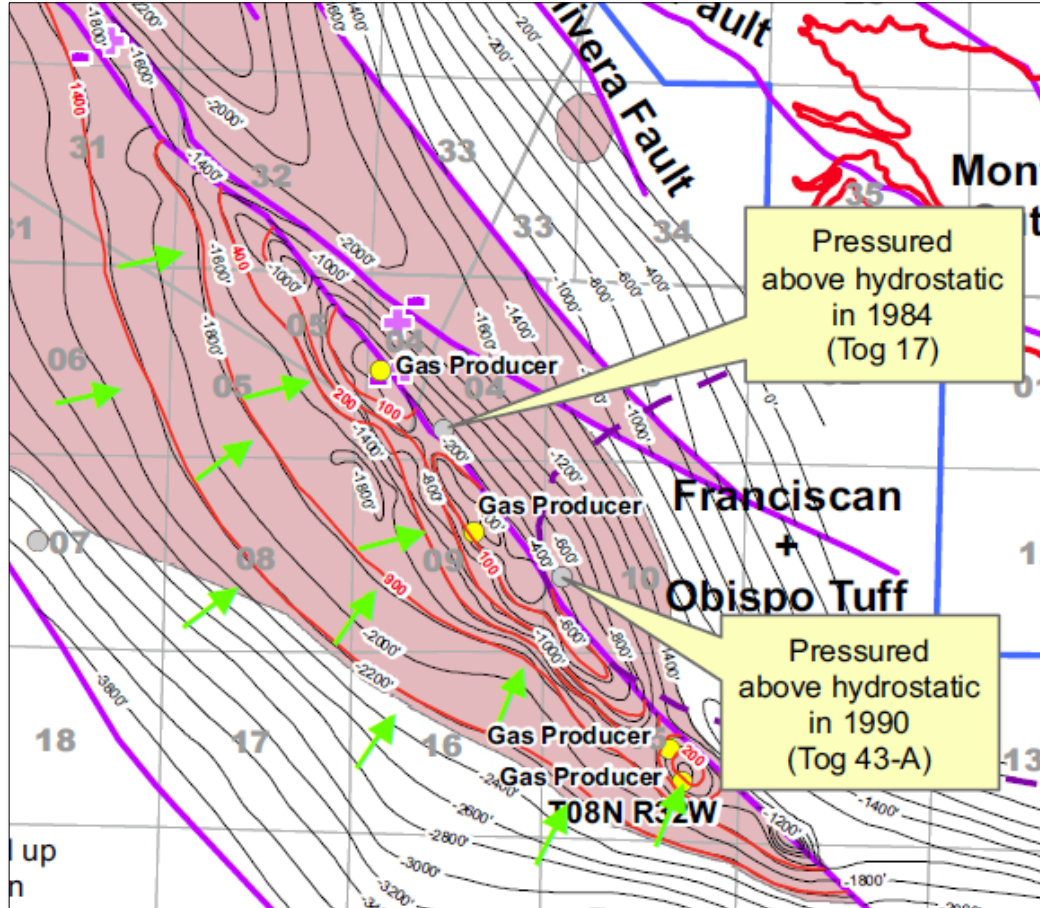
MONTEREY: INWARD PRESSURE GRADIENT



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PRC 3131 (a)

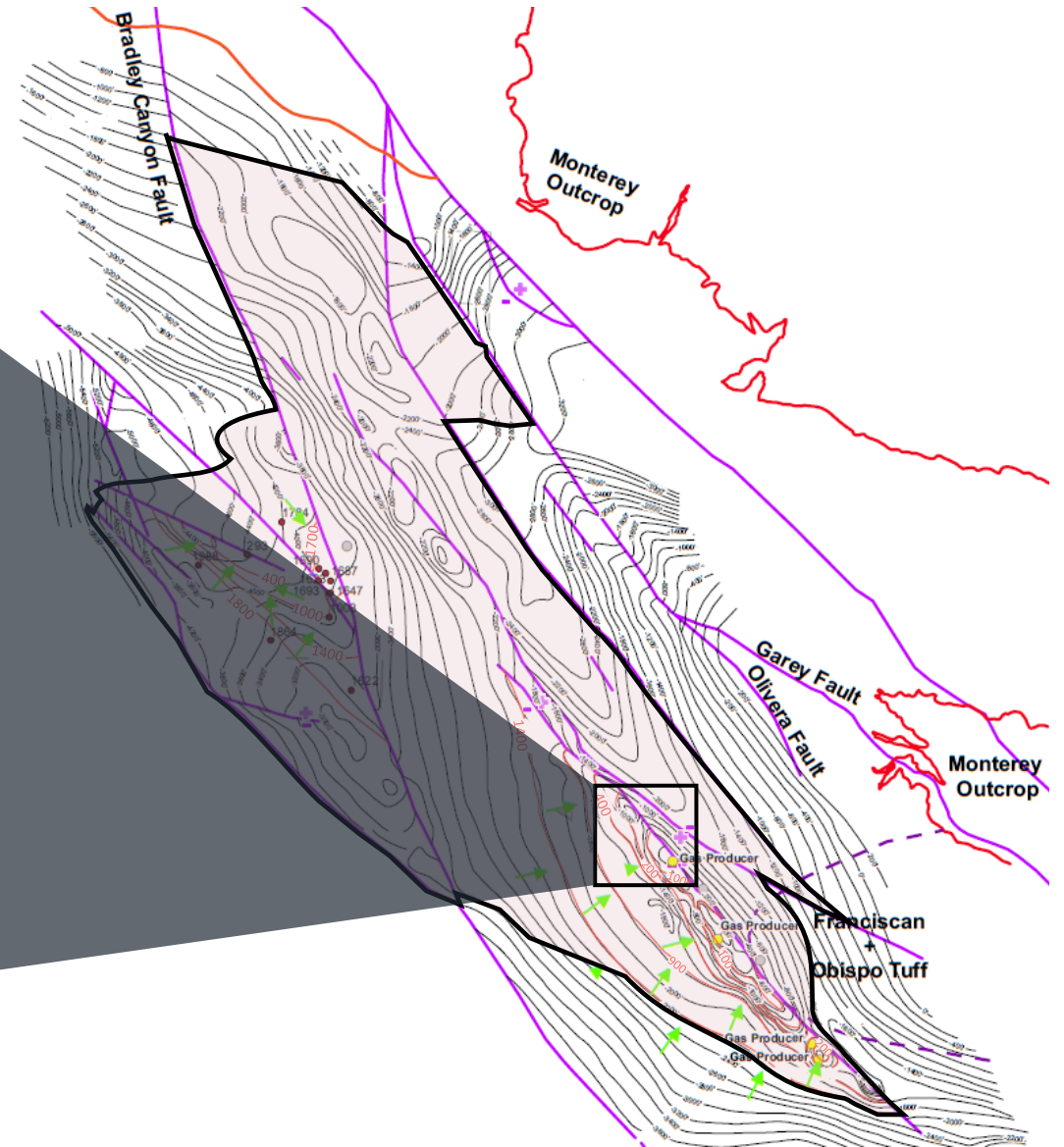
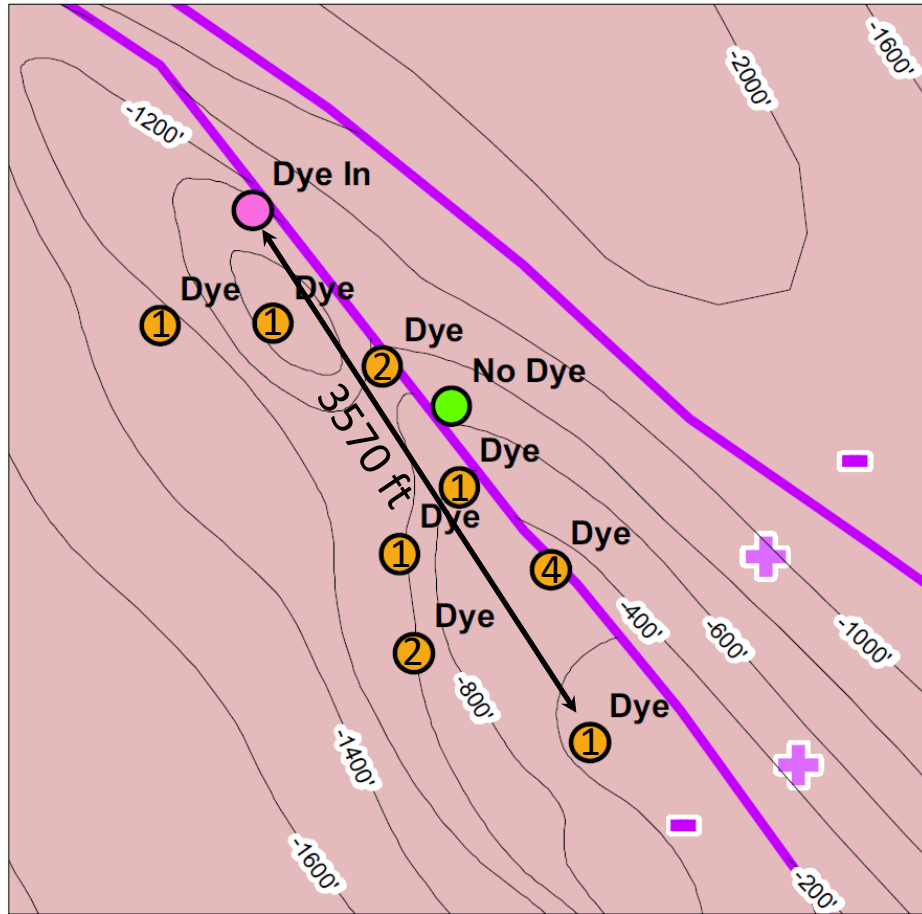
MONTEREY: INWARD PRESSURE GRADIENT



STATE EXEMPTION CRITERIA

PRC 3131 (a)

MONTEREY: DYE TEST



CONCLUSION

40 CFR 146.4

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PRC 3131 (a)

- ✓ 1. Criteria set forth in Section 146.4 of Title 40 of the Code of Federal Regulations.



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CONCLUSION

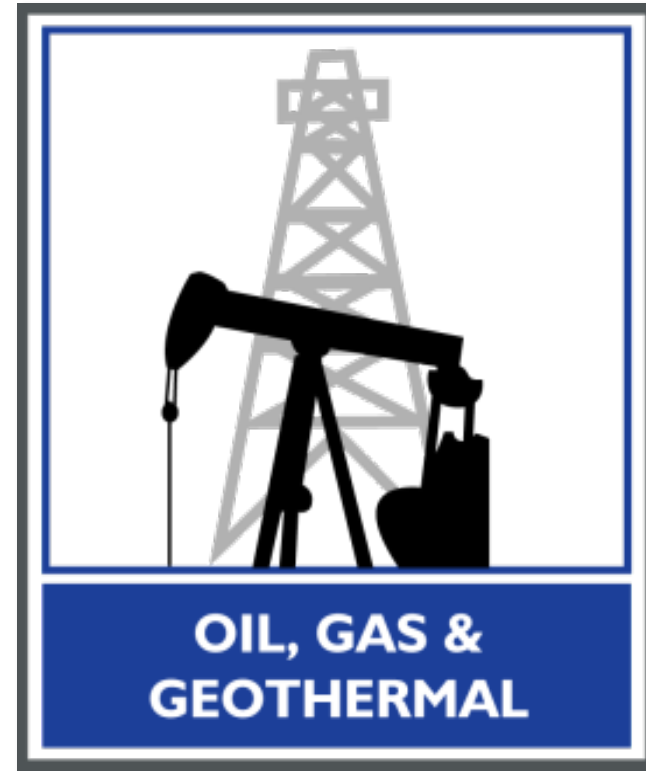
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